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PLOUGHS AND PLOUGHING.

[Concluded from our last.]

Digging Plough.

The chilled-steel cultivating plough is, of course, made in several different forms, one of the most notable being the "digging plough," which is, practically, simply a larger size of the other, designed for doing the work extra deep and extra broken; while, to do away with the necessity of leaving large and deep finishing furrows, reversible or one-way ploughs are common, whereby the furrow-slices are all laid one way, and there are no open furrows left at the finish at all. For sidelong or hillside ploughing one-way ploughs are particularly suitable, as the furrow-slide can then be always thrown downhill, thereby rendering the work much easier. A common practice in America is to plough round and round a field and finish in the centre. This system obviates all the trouble and waste of labour connected with "drawing off" a field into ridges or stretches, making the finishing furrows and turning at the land-ends.

In the writer's district, for instance, the ploughmen actually cannot "open up" a field—even where there are pre-existing furrows—without having the first furrow-slice "chucked away"; if this is not done, then the crown of each ridge will be made to stand up like a turf dyke down the field. Yet this system is actually approved of by the masters and encouraged at the ploughing matches. All this trouble and waste of labour would be obviated by the use of a one-way digging plough.

On digging ploughs and others of a similar nature there is sometimes fitted a tail-knife which cuts and still further divides the furrow-slice after it has passed from the mouldboard. This is an invaluable aid on clay soils which do not readily pulverise, where a wide and deep furrow is being taken, but is not so necessary on the lighter classes.

The Disc-Plough.

And now we come to the plough which is the most recent form of all, and which is only now being introduced into this country. This is the disc-plough, which in the great wheat-growing areas in the States is used in from one to thirty furrow sets, the latter pulled by a powerful traction-engine. The principle of it is simply the same as is adopted in the case of the disc-harrow, the disc-coulter for corndrills, and other adaptations of the revolving disc. In this plough the place of the wrest, with all its adjuncts, is taken by a revolving concave circular plate of steel, which—set at the same angles as the mouldboard would be fixed at, perpendicularly and horizontally—cuts its way through the land, revolving as it goes along, and turning over and pulverising the soil at the same time. The success of this implement on the other side of the Atlantic makes it certain that it would succeed here—at least on the lighter soils and in stubble work—while, on the principle that rotation causes less friction than sliding, it must be easier of draught in proportion to the work done.

In its present form it is, of course, quite capable of improvement for British purposes. We have not, for instance, yet come across a variety with a skim-coulter in front, for it does the cutting work of the ordinary coulter as

it revolves along, like a wheel-coulter in itself. Now for our work a skim-coulter is absolutely necessary. American farmers, with the best implements in the world, do their work in a very slip-shod and slap-dash manner, and in ploughing are not at all particular about making a tidy job and getting all the tails or rags of the surface growth hidden—a style of work which would be fatal to our crops in this damp climate and with our comparatively mild winters, and therefore a skim-coulter (which can easily be put on) is an absolute necessity, more especially in ploughing lea-land.

It must be acknowledged, of course, that a plough of this sort would not work very well in stony or rocky soil. Whenever it encountered a stone it would have a tendency to rise over it, and thus be thrown out of the ground, but for all homogeneous soils of any kind, from sand to clay, it would work exceedingly well.

To sum up, the modern plough is developing into a machine like the following:—The frame will run on the adjustable wheels, to which is attached a disc-breast, with skim-coulter to suit; there will be a seat for the driver, a spring bridle attachment, the wearing surfaces of chilled and polished cast-steel, and the whole of the frame and other parts of comparatively light malleable ribbed-steel; while a trailing tail-knife or prong will be fitted on for the purpose of helping the breaking-up and spreading of the furrow-slice. Probably one furrow will be adopted instead of two, but that will be wide in proportion to its depth, and be much broken up as it is turned over.

DOUBLE-FURROW PLOUGH.

When one begins to study the origin of customs, we find that some curious questions arise. For instance, it is an almost universal rule in this country to have two horses pulling together at the same plough. Why? We are bound to say that we do not know of any reason why, excepting that it is simply a custom. As far as the ability to handle the horses or the implement is concerned there might just as well be three or four animals pulling it, with a corresponding size of plough, or a double or triple set of breasts. Our colonial and American competitors have thrown all these hidebound traditions and customs to the winds, and have gone in for double, triple, quadruple, and any higher number of furrow ploughs, drawn by a corresponding number of horses, and all controlled by one man. They have, of course, large fields or wide stretches of land for their use, but it is the adoption of these forms that is one of the factors in their cheap production of all kinds of crop, and we could most certainly partly adopt them here in many cases. On heavy land, of course, a single furrow-slice 9 inches wide by about 5 inches deep is about enough for a pair of horses to tackle with the ordinary old-fashioned ploughs, but with modern ploughs, and in fairly free-working land, three horses could quite well pull a double-furrow plough, and, indeed, in some instances it is done. Why double and even triple furrow ploughs have not "caught on" better than they have is not easy to explain, though there are two reasons which are apparent. One is that in the past a multiple-furrow plough has been of such a massive, clumsy make that there was no comfort in handling it—more especially in a district of small fields; and the other reason is that the ordinary ploughman does not want it to succeed. An implement or a system which is going to do the work with, say, half the usual number of men and horses, is not going to be hailed with pleasure by the ordinary working man, who fears he may lose his job; and, consequently, the innovation will not succeed unless it is tackled by the farmer himself or someone interested in its success. The rural population has so long been accustomed to one man attending to two horses and working with them that it will take some work to get that man to look after three; but it has been done. Some farmers have written in the agricultural Press that they have induced their men to adopt the system by a small rise in their wages, and it is only a matter of keeping the thing going for a little while to make it a custom and habit. The adoption

of a duplex plough with one man and, say, three horses to work it is certainly a modern development of ploughing which might be very successfully adopted in many cases, and would certainly help to cheapen the cost of production.

At the same time, there is a great deal to be said in favour of sticking to the old system of pair-horse work. If a double-furrow plough is adopted, requiring three horses to pull it, it means that another man's pair must be broken up to get the third horse, and this is an innovation which the men in some districts would never agree to. If, on the other hand, it is arranged that one man shall handle three horses, then it means that all our other implements will have to be on a three-horse scale—harrows, rollers, mowers, &c. It is doubtful if this would be any benefit in the long run, while it certainly would involve a tremendous expense and upset on a farm. It could not be applied in the case of carting, for while one man can handle two horses with two carts, or a two-horse wagon, three horses are out of the question. If ploughing were the only or the principal kind of field work done on a farm—as is the case in some districts in America— then a double-furrow plough with three horses would be an undoubted benefit; but the difficulty of getting a three-horse system to fit in all the year round, at all sorts of work, must be considered by anyone who thinks of adopting this innovation.

It has been said that no one plough can do all the different kinds of ploughing required by a farmer—not merely on different kinds of soil, but on the same kinds of soil on the same farm at different times. The implement which does stubble work fairly well, or which makes good enough work on a bare fallow, may be quite unsuited for ploughing up grass land. Again, a plough which does well on a light, sandy loam may be a complete failure on a stiff clay. The converse of these statements, however, does not hold true, for a plough which will turn over a satisfactory furrow in a stiff clayey pasture will work satisfactorily anywhere else. On a rough fallow, of course, wheels will not run very well, though even that difficulty can be met. The writer has tried many ploughs in his time, and on many different soils, and is of opinion that many of the modern forms, which have two or three wheels, a skim-coulter, and a chilled-steel breast, will serve well as general purpose ploughs, and do any kind of work better than the old ones.

Special Ploughs.

It is not possible, within any reasonable limits, to go into the merits and demerits of all the "special" kinds of ploughs which are used for various purposes in different districts. The typical varieties of the common form have been discussed, and the principles which apply to them should act as a guide in respect of all the others. These others may be classified under such headings as:—

Subsoiling.
Ridging.
Paring.
Potato-raising.
Draining or Gripping.
Multiple-furrow.
Steam.

Many of our common general-purpose ploughs can be converted into the digging, subsoiling, ridging, paring, potato-raising, and gripping forms by simply taking off the working parts and fitting on the suitable "irons" (now steel-made) for the work in hand, and a convertible plough of this sort is a decidedly useful implement on a farm. For subsoiling, a special tine is fitted on in front of the breast, which penetrates and tears through the soil along the bottom of the *previous* furrow; or else the "irons" are taken off and a special chisel-share put on, which rips up the "pan" or hard bottom of the furrow behind another plough. One maker in this way advertises a plough which can be converted into twenty-six different implements.

The ridging-plough—sometimes called the double mouldboard plough—is simply one with a right and left breast to throw the mould out to both sides, and thus make a balk or ridge for roots or potatoes. Nowadays there is an increasing tendency to fit these breasts in two or three sets on to the modern cultivator frame—a vast improvement; but they can be had adapted to fit on to the ordinary plough-frame.

For potato-raising a ribbed frame, like the fingers of an open hand, is fitted on in place of the sole-plate—the "irons" and breast being removed—and the earth containing the potatoes flitters through the prongs or ribs as the plough passes along through the ridge or balk, leaving the tubers mostly on the surface.

The draining or gripping form can also be adjusted on to the ordinary frame. This is for cutting a small trench or "groep" in grass land on clay soil, to help the running off of the surface-water. This can, of course, be done by the ordinary plough, set over to the "land" side so as to run edgeways, and thus cut out a triangular furrow-slice; but a special cutting share and other parts can be fitted on with some makers' ploughs, and do much better work.

The multiple-plough is simply the double-furrow form, with extra shares and breasts for use on light land where one or two furrows do not absorb all the force of an ordinary team of horses. The furrows cut are usually smaller in size than with the regular ordinary plough, and the work is mostly done where seed is ploughed in to a shallow depth or in working a loose fallow.

The steam plough is the adaptation of the plough to a giant scale of work to suit the unlimited power which can be developed by a large engine. It is a multiple plough, on the same scale as the largest of single-furrow ploughs, while of necessity it is also a one-way plough. It is worthy of note that the benefits of steam ploughing have been largely handicapped by the depth of our ordinary soils.

CONCLUSION.

Many of these methods could not, of course, be adopted here in our small fields, wet climate, and, perhaps, stiff clay soil; but it is desirable that the implements our competitors use, and their methods of use, should be known to us, to realise where we are in the struggle for agricultural existence. Some of their ploughs and style of work we have adopted already in modified forms, but there is immense room for improvement yet, and the writer has endeavoured to show in the above pages what are the most recent ideas on the matter, both as regards the plough itself and the style of work which should be done by it. That in many districts in this country we are a long way behind, the writer has reason to know to his sorrow. There is a great deal more bad ploughing about than good, and this is not altogether the fault of the men, for there are whole districts where not one farmer in twenty understands either the plough or the work it is intended to do, although they may have been at it all their lives. Some keep on working with the old wooden plough, which has not been much altered since the days when Alfred was King of the West Saxons, and any attempt to introduce a modern improved variety, with chilled-steel working parts, steel frame, and wheels, is resented. Some who have tried a modern form have not had the knowledge or the patience to adapt it to their land or special work, and have thrown the implement aside and returned to the good old historic methods. It is certain, however, that, if our arable farming is to head the procession of the world in the future as it has done in the past, modern implements and modern styles of work must be adopted; and, while some districts in these islands have put into practical use most of what has been said above, there are other districts where they have not yet learned the alphabet of ploughing.—*Journal of Agriculture*, London.

CANARY SEED.

The European supply of this seed comes from Barbary, Magazan, Algiers, Tangier, Spain, and Turkey. That from Spain and Tangier is the highest-priced, being now quoted at from 77s. to 80s. per quarter of 480 lb., equal to 9s. 7½d. to 10s. per bushel of 60 lb. Algerian is the lowest in price, ranging from 60s. to 68s. per quarter, according to quality. Some—who have had no experience of growing this valuable crop in Queensland—say that no machine will thresh out the seed, and that the old-fashioned flail has to be used. This is quite erroneous. The wheat-threshing machine will perform the work perfectly, only it must be in charge of a man who thoroughly understands the setting of the machine, to avoid skinning and crushing the seed on the one hand, and leaving a quantity of seed in the half-threshed heads on the other. Again, it has been said that 60 lb. of seed are required to be sown per acre. Practical experience in Queensland shows this also to be widely over the mark, as from 10 lb. to 15 lb. of seed are ample. The straw, which, by the way, is never affected by rust, makes excellent chaff for horse-feed. The best soil for the crop is a light, loamy, stony soil, such as may be found about Southbrook, on the Downs, and in many other parts of the Downs district. Plenty of suitable soil may be found in the Moreton, Logan, and Ipswich districts. The objection to growing canary seed on the coast, however, is, that no threshing machines are used, as wheat is not grown to any extent. It would not pay one farmer to buy a threshing machine for a small crop.

PLANTING UNRIPE POTATOES.

A considerable amount of correspondence has been published in various newspapers in the United Kingdom on the subject of the advantage or disadvantage of using unripe potatoes for seed. One writer says that a farmer at Dalmeny was in the habit of growing two crops of potatoes on the same ground in one season. The second crop was planted in July after the first crop had been raised and put to market; the second crop was raised in the autumn and boxed for seed for the following spring. Some of the early varieties, if left in the ground till ripe, would be all gone with disease, and it is a common thing to raise them before they are ripe. A Mr. Wallace said that, through digging the Early Puritans in a green and unripe state, the variety has retained its vigour and has shown no signs of flagging for sixteen years. Ninetyfold has, he said, done the same, and both are most delicate potatoes. The only reason for and the whole secret of this result is digging them while green. In discussing this point another writer asks: Does this what may be called ensilage system apply only to two varieties, or is it applicable to all? If to all, why then is it not generally adopted? Further, if digging potatoes while green is possessed of so many distinct and compensating virtues, why are not all potato crops secured while the days are long, and weather fine, and disease not yet generated? Again, apart from this, how do the unripe tubers stand the test of quality and flavour from the consumer's point of view? People usually like a dry, mealy, full-flavoured potato instead of a waxy or soppy one.

A third writer is quite convinced of the strong growth of unripe seed potatoes. He had practical experience of the matter. He bought seed which had been dug in a very unripe state. The skins were torn and much ruffled, and the potatoes had been exposed to the weather, and were consequently green, yet he grew a splendid crop from them.

Scotch potatoes are seldom ripe. It is very rare that a late potato crop in Scotland is seen to yellow down in natural ripeness. More often they are standing fresh, green, and even in bloom on 1st October, and a fortnight later the crop is stored. To this immature state of the tuber is attributed the splendid virility of Scotch tubers as seed. The whole matter seems to us to

be still an open question. The exponents on either side prove the case to their own satisfaction, but no actual decision has been arrived at. It would require a dozen years of careful experiment to settle the matter. So far it is like a man being asked if he would take black tea or green, and he said he would.

FARM TELEPHONES.

If the telephone saves the city man many a fruitless journey when making business inquiries, it should have an equal use in saving the farmer from many a journey to a market. We noticed that at Barcaldine, on the Central Western line, several farmers have telephonic communication with the town. If one of them wishes to see anyone in particular in town, instead of saddling or harnessing up his horse and travelling six or eight miles there and the same distance back, only finding the "visitee" absent on his arrival, he rings him up on his telephone. Should he be absent, a journey is saved. These telephones are run along the fencing wires, and the only interruption to their regular working is caused by the vagrant, wind-borne kerosene-tin reposing restfully against the wires, or by the occasional irruption of hoop-iron, which seems, for some inscrutable reason, to be sown broadcast on some of the Barcaldine roads.

Over half a million of these rural telephones are in use in the United States of America. One farmer there says that he can keep himself in touch with the markets, thus sparing himself useless trips when produce is low: he gets double the work out of his teams by their not being so frequently on the road; he has saved the hire of two men by being able to remain at home and look after the work himself, thus preventing loafing and scamping in his absence at market. In cases of sudden sickness on the farm, the telephone is invaluable in obtaining medical aid at short notice. The value of the farm telephone to the tradespeople in the rural districts of America is so well recognised by them that they actually pay the rent of the instrument for farmers who spend £5 a month at their stores. The reason is, that they save time, save one man calling for orders, and get a good advertisement for their business as well.

SOME USES OF OLIVE OIL.

A tablespoonful of olive oil a day, taken internally, will help liver trouble and indigestion. It is also healing for throat or stomach catarrh. Serve it frequently in salad dressings, where it will be both appetiser and medicine. For severe internal disorders or emaciated and run-down condition of the body, rub the patient every morning for twenty minutes with the oil, then with a bath-towel; at night rub the spine for ten minutes, and in two months you will see great improvement. Mixed with quinine, then rubbed on the chest and back, it prevents cold; mixed with camphor, then applied to the throat, it cures soreness; mixed with kerosene and turpentine, then used on the throat and chest, it relieves the most obstinate cough. Heated and applied to the bowels, it helps constipation. Try it for chapped hands and for roughened or burned skin. Before putting away the stove, rub the nickel parts with the oil, also the gasoline oven or other sheet iron, and you will see no rust. Use it on shoes instead of blacking. It is especially good on patent leather; apply at night, rub off and polish in the morning.

Dairying.

BACON-CURING.

We are continually receiving queries on the subject of bacon-curing, and have already given our readers fourteen articles on the subject, but, on the principle that a good thing cannot be repeated too often, and considering that many of our readers have only received the *Journal* since the beginning of the year, we print the following *résumé* of an article by Mr. G. Valder, when Principal of Hawkesbury College, New South Wales:—

After dealing with the importance of thorough bleeding and the fact that the heart should not be touched by the knife, he says:—

After the pig has been thoroughly cleaned, cut the legs below the gambrel joint, so that the main cords may be reached under which the gambrel should be inserted. The carcass is hung up and disembowelled, a piece of wood having been inserted into the mouth to keep the jaws open, and allow the blood to run out. The inside of the carcass is next thoroughly cleaned and hung up in a cool place until the meat is firm enough to cut up. Great care must be taken in cutting the hams, as shapely hams always command a better price than those badly cut.

For Dry Curing

we have a choice of several mixtures. The following has obtained much favour in Southern Australia:—For every 100 lb. of meat take 3 lb. of coarse salt, 2 lb. of brown sugar, 1 lb. of allspice, 2 oz. saltpetre well powdered, and 1 oz. carbonate of soda; mix well together. If the other ingredients are not available, salt and sugar in equal parts, with a little saltpetre, will give good results. If possible, rub the meat first with 1 lb. of honey for every 100 lb. of meat. Then rub with about two-thirds of the preparation until it begins to stick well, which is generally in about seven minutes. The first two days' rubbing is the most important, and unless the meat cures then it is not in a suitable condition. After such rubbing, stack the meat in a tank, first putting a thin layer of salt at the bottom; a layer of sides is put on this with the rind downwards, then another layer is crossed on this, and so on until all the bacon has been put in. After twenty-four hours, turn and rub again, adding a little more of the unused mixture, after which turn and rub once in every forty-eight hours, using a little more of the mixture each time. Place the sides which are on the top to-day on the bottom to-morrow, and so on. After twenty-one days in pickle, it is ready for washing, drying, trimming, and smoking.

Place in water just warm enough to bear one's hands in, and then brush over with a dandy brush, which removes all fat, sugar, slime, &c. Then place in a tank with clean, cool water, for twenty-four hours. This takes the surplus salt out, and renders it mild-cured bacon. Afterwards hang up in a dry place where there is a good draught. If the days are fine and dry, with a slight breeze of wind, the bacon is generally sufficiently dry in about a week.

In trimming the bacon the sharp points of the rib-bones are sawn off, and the remaining part of the fore leg also sawn off level with the shoulder. The knife is then run over the belly part of the rib-bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance.

Smoking.

It is then ready for the smoke-house. The walls of the house should be 12 feet high, and the smoke should be conducted to the bacon as cool as possible. Hang the meat close to the top, in rows about 6 inches apart. From four to five days' smoking is given, care being taken not to smoke too

much, as this greatly affects the flavour. Hardwood sawdust, damp maize-cobs, branches of eucalyptus free from all traces of gum, or stinkwort gathered with the sap in it and stored till dry, make excellent smoke. Light a small fire on the floor of the smoke-house, and place on it a few handfuls of sawdust. Then lay a sheet of galvanised iron on top, which will cause the fire to smoulder and produce smoke only. About 3 feet above this suspend another piece of galvanised iron, so as to prevent any heat from the fire reaching the bacon. After they leave the smoking-house, it is well to go over the hams and hands with lard and pollard and stop up any place that is likely to be attacked by flies. Finally, place the hams and hands in calico bags, taking care to tie them tightly at the top, and hang them from the ceiling until the weather gets warm. They can then be packed away in perfectly dry bran or sawdust, and should be taken out every six weeks and examined. If there should be any trace of mildew or sweating, it should be rubbed off with a cloth, and a little chaff added to the bran or sawdust. Keep as far as possible an even temperature. Too much heat will cause the fat to melt and turn musty, and if too damp it will sweat and decay. By curing and treating bacon in this way an article can be obtained which will always command a good price and will keep for many years.

GIVE ANGORA GOATS GOOD CARE.

A writer in the *American Agriculturist* speaks very highly of Angora goats, but says that they need good care. Doubtless this is true, but it is also true of improved breeds of any kind of stock, horses, cattle, or hogs. His conclusion that it is useless to attempt to keep goats unless you have a fenced pasture, is incorrect. Doubtless a well-fenced pasture would be better than to allow them to run at large in the woods. But the latter way can be made profitable. If the flock is large enough, a herder kept with them at all times would prove to be a great advantage in many ways.

Do not try to keep Angora goats unless you have a well-fenced pasture and unless you are willing to take good care of them. If you want to keep a pretty large number, you should have a good-sized pasture with plenty of brush and weeds and good clean water. If wolves and bad dogs are plentiful, you will need a wolf-proof fence. You do not want a public road through your Angora pasture, because travellers often leave gates open, and have dogs which will chase your flock and tear up and kill a good many of your valuable animals.

If you want to keep only a few, they will stay near home, and will have their regular range, just like milch cows. If they should get into your neighbour's field or garden or orchard, tell your neighbour to pen them at his house and keep them in the pen all day and all night until the next day about noon, and then drive them home, and they will probably stay away from there. If they should come back, let the dogs catch the bell goat right in the garden, orchard, or field, and drive them towards home, being careful to get the dogs off before they hurt any of the goats. If the dogs should hurt the bell goat a little, it will be a good lesson for her to stay away from there.

Upon receiving Angoras sent by express or freight, be careful to prevent their drinking too much water in case they arrive very dry and thirsty. Also do not give them too much feed of one kind, especially wilted feed.

When they arrive it is best to put the crates into a large pen and open the crates by taking off one of the top slats, after having placed the crate on its side, so that the top slats are upright. These crates, being quite substantial, make good chicken coops. I generally have them returned whenever they go only a few hundred miles. During the last twelve years all my shipments have arrived in good shape.

WHAT GIRLS CAN DO.

The following interesting account of successful girl-work in California is taken by the *Florida Agriculturist* from the *American Sheepbreeder*. It is good enough for us to place before our girl readers in the bush, and we know we have many such who take great interest in the *Agricultural Journal*. The story is vouched for as true by two reliable papers. It is not intended for girls whose aim in life is to see a description of their dresses in society papers, but it is meant for the hundreds of strong, healthy girls, with any amount of go in them, such as may be met on scores of farms and selections in Queensland. The paper in entitled—

STORY OF A CALIFORNIA GOAT RANCH, MANAGED BY THE YEATON AND CHAMPENOIS GIRLS.

An Angora goat ranch owned and managed by three girls and 1,500 splendid Angora goats that know no other shepherd than the three sisters present a unique enterprise in Northern California that has resulted in giving a fortune to the three plucky, enterprising young ladies, who have been patiently and ploddingly breeding these profitable little animals for the past thirteen years.

The loss of their father left the management of what was proving to be a very poor cattle ranch and range to the mother and three daughters, Ina Yeaton, Ethel and Berdie Champenois, who met the situation by securing a small flock of well-bred Angoras. The lack of grass and the poor grazing so detrimental to the handling of cattle on their place was liberally offset by Nature through provision of an abundance of brushy growths affording the best feed for the Angora, and making possible the conversion of a practically worthless cattle ranch into a successful Angora enterprise. Contemplated plans of abandonment were gradually changed into a feeling of contentment as the new stock thrived and the flock increased.

A summer range was secured to relieve that of the home ranch to which pilgrimages have been made annually by the mother, daughters, and their entire flock. The summer home in the mountains is visited each year, and maintained until fall. The moving of the goats is said to present a most interesting sight, for but for the fact that one of the girls is ahead and leading them no progress could be made. The journey is one of about 80 miles, and, while willing to follow their owners where'er they will, to drive them without inspiring in them the confidence coming from the leadership by one to whom they have ever been accustomed has proved a fruitless task.

Fifteen hundred goats on the range are rather hard subjects to control before a camera, but if the professional photographer could have the magic success in getting the average "kid" into line that was experienced with these several hundred "kids" as a result of about four varying peculiar yells from a pair of strong feminine lungs, that made every Angora swing into position and pose as though at the command of a general, he of the studio would certainly make a decided hit with nursery subjects.

Such command of the flock comes but from constant association with it, one of the girls being ever with the goats on the range. Clad in short skirt, neat waist, broad Mexican hat, high, stout shoes, and always carrying her faithful Winchester, the flock is ever under the control of one whom each animal has come to know and respect.

At home, about the corrals, sheds, and pastures, the other sisters are ever busybodies while the flock is on the range, suits common on the average farm, it is admitted, being often found far more convenient than skirts while repairing fences and performing other similar work.

The old proverb that many hands make light work has proved not amiss here, and, by that good management characteristic of all successful enterprises, attendance at school has not been neglected. The magnitude of their enterprise now makes possible the hiring of assistants, and three well-educated, accom-

plished, and now quite wealthy young Shasta county ladies are longingly looking forward to their proposed visit to the World's Fair at St. Louis, to see a steamboat, an electric car, and the myriad of things wonderful that are not found 'mid the chaparral and manzanita of the Californian hills.

As an incident illustrating the able manner in which their enterprise has been conducted, and one that surely pays a marked compliment to its management, is an experience had by the writer two years ago. Visiting the Sanford Mills at that time, inquiry there concerning the best shipments of mohair received from Western breeders brought out particular reference to a California clip of high-class mohair that had been coming to these mills annually in a splendid condition, but ever under the partnership name of Yeaton and Champenois, all of which was suggestive to them that in these shippers one would find a most enterprising firm of Angora breeders, and one from whom many valuable suggestions in flock management could be gained. Urged to visit this ranch if ever in its vicinity, an opportunity to do so was recently afforded when *en route* from Portland to San Francisco, and the interesting *personnel* of the "enterprising firm of breeders" was discovered far back in the hills from a little station on the picturesque Siskou line. Likewise, too, the "many valuable suggestions."

On this ranch the revenue from the flock comes wholly from the sale of mohair, meat, and pelts, no fancy stock being raised. Here is a most convincing example of the worth of the Angora as a range animal, and the success of the three plucky sisters should in itself prove a "valuable suggestion" to other owners of rough Western range lands.

We have instances in Queensland of girls keeping a farm going for their old parents, but why should they not only keep it going, but do so in such a way as to eventually enable them to enjoy the luxuries as well as the toils of life. What American girls can do we feel sure that those of Australia can do. As Captain Bunsby said, "The moral lies in the application thereof."

HOW TO KEEP MILK AND CREAM SWEET AND COOL.

By G. S. THOMSON, F.R.S. Ed., N.D.D., &c., Government Dairy Instructor, Queensland.

This is a most interesting and vitally important question to the factory manager, and one which has been discussed very much of late; but, to my knowledge, not a great deal has been published to illustrate the efficiency of any particular method or system of cooling the raw produce of the dairy farm.

Aeration has been talked of in Queensland, and the introduction of suitable appliances has been very strongly recommended by authorities on the science and practice of dairying, as the benefits arising from its use are unquestionably great, not only to the factory supplier, but the industry generally is ably assisted and encouraged. Artificial cooling with ice cannot be entertained on the average farm, as conditions are not favourable to enable us to follow the practice which is so profitably carried out in Denmark and other cold countries where ice is cheap and the supply abundant.

To the ordinary observer, Denmark's precautionary measures in cooling milk on the farm seem unnecessary where climate is adverse to the speedy propagation of germ life and the development of acids and taints in perishable dairy produce. But the Dane has found it productive of good in the manufacture of butter and cheese to prosecute the system of cooling with increasing energy and to abide by the legislation of the country and the demands of responsible factors bearing upon the success and welfare of the industry.

Now, the question presents itself to the Queensland dairyman thus:—"If continental countries find it imperative to enforce measures to make aeration of milk a necessity, why should we in a much warmer climate not do something on similar lines to minimise the heavy losses accruing from want

of close attention to the physical properties of milk and cream supplies on the farm, and thereby extend their keeping qualities for increased profit in the manufacture of marketable produce of a higher standard of excellence?"

Because ice is not procurable and cold water a rarity in summer, is not sufficiently argumentative to entirely free us of all charges made against the industry for lack of enterprise in the use of some simple and inexpensive appliance to mitigate against the ravages of fermentation and to assist in expelling from milk and cream repugnant flavours peculiar to plant life commonly met with throughout the dairying districts of Queensland at certain periods of the year. The application of aerators, farm refrigerators, and coolers would, I am sure, amply repay for their purchase, and the time and trouble necessitated in working them would occasion no objection by the progressive and intelligent dairyman whose desire is to keep abreast of the times and turn his occupation and energies to the most remunerative account. The protection of vessels of milk and cream from the destructive influences of direct sunlight and a sweltering atmosphere is another question for the serious consideration of all persons interested in the future success and prosperity of Queensland dairying, and it need not be reiterated at this stage in our paper what evils emanate from the above cause to the detriment of the manufactured article. The object of this bulletin is to give a practical account of experiments conducted at the instigation of the writer in the cooling of milk and cream while in the service of the South Australian Government. These were carried out as follows:—

COOLING MILK.

At a carefully selected factory three suppliers were instructed to send daily three 10-gallon cans of milk, and those chosen were from 9 to 13 miles distant. The directions given to the suppliers were to cover two of the cans with calico, leaving the third uncovered. At the close of each evening's milking 5 gallons of milk was to be put into each can, but one vessel must have its cover saturated with water, placing the cans under similar conditions until morning, when the remaining 5 gallons were to be added, and additional water poured over the same cover, the other two remaining as before.

On arrival at the factory the first day of the test (Monday) the nine cans registered the following percentages of acid. Fresh drawn milk taken at 0.18:—

	Wet Cover.	Dry Cover.	Without Cover.
First Farm ...	0.20 ...	0.22 ...	0.23
Second Farm ...	0.21 ...	0.23 ...	0.22
Third Farm ...	0.20 ...	0.22 ...	0.23
On Tuesday morning the acidity went down—			
First Farm ...	0.18 ...	0.21 ...	0.21
Second Farm ...	0.19 ...	0.23 ...	0.20
Third Farm ...	0.18 ...	0.20 ...	0.22

Temperature of milk, Monday morning—

	Wet Cover.	Dry Cover.	Without Cover.
First Farm ...	76 deg. Fahr.	82 deg. Fahr.	81 deg. Fahr.
Second Farm ...	72 deg. Fahr.	80 deg. Fahr.	79 deg. Fahr.
Third Farm ...	74 deg. Fahr.	78 deg. Fahr.	83 deg. Fahr.
Tuesday morning—			
First Farm ...	66 deg. Fahr.	73 deg. Fahr.	74 deg. Fahr.
Second Farm ...	71 deg. Fahr.	74 deg. Fahr.	73 deg. Fahr.
Third Farm ...	61 deg. Fahr.	69 deg. Fahr.	79 deg. Fahr.

Up to this stage of the test a couple of hot days set in, and at the close the acidity of the milk and temperature showed a marked variation—

	Wet Cover.	Dry Cover.	Without Cover.
First Farm ...	0.20 ...	0.23 ...	0.22
Second Farm ...	0.20 ...	0.22 ...	0.24
Third Farm ...	0.19 ...	0.25 ...	0.25

Temperature—

	Wet Cover.	Dry Cover.	Without Cover.
First Farm ...	77 deg. Fahr	84 deg. Fahr.	86 deg. Fahr.
Second Farm ...	78 deg. Fahr.	88 deg. Fahr.	87 deg. Fahr.
Third Farm ...	76 deg. Fahr.	85 deg. Fahr.	86 deg. Fahr.

In proof of the profits to be gained by covering cans with calico and wetting same, the following reply was received from one of the managers (Mr. John Davidson), who took a very active interest and did good work in experimenting in different branches of factory dairying.

ACID TESTING OF MILK SUPPLIES.

Experiment with four supplies of milk, two *distant* and two *near* to factor:—

At the request of Mr. G. S. Thomson, dairy instructor, I carried out an experiment on three supplies of milk at the Murrimbum factory with the acidity apparatus for the purpose of determining the effect of cooling and cleanliness in preventing the development of acid in milk. The four supplies were tested daily for a space of three weeks during November. Whenever a high acid reading was found in a supplier's milk, instructions were given to thoroughly cleanse and sterilise cans and utensils and properly cool down milk immediately it was drawn from the cow.

In conducting the test with the three cans, the milk in the vessel covered with wet calico had 1 to 3 points less acid, and the temperature, which was taken each morning, was from 1 to 4 degrees lower in the covered can; *the greatest difference in temperature prevailed when the weather was warm and the sun hot*, which shows that the most profitable results would be obtained during the extreme heat of summer, as afterwards illustrated. One supplier aerated a can in addition to cooling, when the percentage of acid was surprisingly low.

An experiment tried apart from the above, with wet cover, on an exceedingly hot morning, proved that by evaporation and protection from the sun—afforded by wet cover—kept a can of milk 10 degrees cooler than uncovered milk during a journey of 2½ miles.

The results of these experiments have been so satisfactory that I now have the wet envelope system generally adopted by my suppliers, and, as they themselves say, it prevents risk of rejection and saves many a can of milk in a season.

The same gentleman submitted an additional report of tests which I herewith append:—

AERATION OF MILK.

In order to demonstrate to milk suppliers and others the beneficial effects of the aeration of milk directly after milking, I have during the present season conducted a number of practical experiments with that end in view. People as a rule are averse to adopt a custom before they have had ample proof of its beneficial effects. An alteration in the manner of keeping milk which will materially increase the quantity and improve the quality of a whole factory's supply of milk cannot but commend itself to the favourable consideration of milk suppliers and factory proprietors alike. It is within the mark to say that by a thorough system of aeration and cooling by suppliers the milk received at the average factory would be enhanced in quality nearly 50 per cent. and the supply of a season increased several thousands of gallons. In almost every dairying district thousands of gallons of Saturday night's and Sunday's milk are fed to pigs, or made into butter and sold for actually half the money that would be received were it kept sweet and delivered to the local factory. As a result of aeration, cooling, and rigorous cleanliness of milk utensils which was recommended in this district, I find from comparative figures that 5,000 odd gallons of Saturday night's and Sunday night's milk have been delivered to the Murrimbum factory, from 1st September to 31st December (four months)—milk which would formerly have been fed to pigs or calves or converted into cheap butter. Previous to this no milk more than twelve hours old was received

for cheesemaking, except during the three winter months, while on several occasions during November and December I have received Saturday evening's aerated milk on Monday morning, containing a sufficiently low percentage of acid (0.24) to pass for cheesemaking, and on all occasions cheese made from such milk was first class. Some may look askance at this statement, but milk containing 0.28 per cent. of acid (normal milk 0.18 per cent.) can be received with safety, provided the bulk is sweet.

By aeration, &c., and a due regard for cleanliness my milk suppliers' cheques have been considerably swollen; besides, the profits of the factory are increased by the manipulation of a large quantity of milk which otherwise would have been next to wasted.

The appended results of experiments, which were carefully carried out, I have submitted for the benefit of the industry at the request of the Dairy Instructor (Mr. G. S. Thomson). The aerator used is one by which pure air is forced through the milk while in an ordinary milk-can, the milk by its action receiving simultaneous agitation while the air is forced through the milk, thus driving out smells and gases. For determining the percentage of acid in the samples of milk treated, the acidity apparatus was used—an instrument I can speak of in superlative terms as a correct indicator of the acid condition of doubtful milk at the weigh-can; second, the condition of milk before renneting; third, acid in curd at salting; fourth, in butter-making, the proper stage of cream ripening before churning.

To the cheesemaker who aims at uniformity in his product the acidity apparatus is as important as the mariner's compass is to the sailor or the field-glass to the army scout. It must be borne in mind that the aeration of milk accomplishes two objects, viz.:—Retarding the development of lactic acid; and the expelling of animal odours produced by bad water, rank pasture, and other agents. By the aid of a scientific instrument the exact percentage of acid has been arrived at in aerated milk. Formerly, to ascertain the second object, in the absence of means for bacteriological examination, the sense of smell and taste had to determine the presence or absence of good or bad smells, flavours, or progress of germs of evil ferments. However, the following tables will show the good effects of aeration and cooling:—

Experiment 1.

Equal quantities of night's milk were measured into two cans; after milking, one was aerated and the other left as drawn—

Aerated Milk.				Unaerated Milk.	
Date and Hour.	Temperature before Aeration.	Temperature after Aeration.	Per Cent. Acid.	Temperature.	Per Cent. Acid.
November. 16th, 6·30 p.m.	88 degrees	83 degrees	0·20	86 degrees	0·24

The test for acid was made at 6.30 on the following morning. The conditions were similar, though the unaerated milk had the advantage of being 2 degrees lower at the time of the operation. The aerated milk was infinitely superior in taste, being free of odours. The unaerated milk possessed a distinct "cowy" odour and a flavour of dandelion. In addition to being wholesome in flavour, the aerated milk showed 0.04 less acid than the unaerated milk.

Experiment 2.

Three cans of milk were treated in this test on 26th November, 1900:—

1 can, 12 gallons, aerated Sunday morning, showed 0.21 acid on Monday morning.

1 can, 8 gallons, cold Sunday evening, showed 0.19 acid on Monday morning.

1 can, 8 gallons, cooled only 65 degrees Fahr. Sunday evening, showed 0.23 acid on Monday morning.

It will be seen that the milk which was aerated only and stood 36 hours (12 hours during the heat of daytime) contained 0.02 less acid than the milk which was cooled to 65 degrees and stood for 12 hours only.

The absence of evil flavours in the aerated cans of milk was again distinctly noticeable. This was testified by several persons who were unaware of the distinctive treatment.

Experiment 3.

4th December.—Four equal quantities were treated immediately after milking, and tested twelve hours later on the following morning:—

Description.	Temperature before Aeration.	Temperature after Aeration.	Per cent. Acid.	Conditions.	Time Coagulating.
	Degrees.	Degrees.			
1 can aerated and cooled	94	74	0·19	Sweet, good flavour ...	40 hours
1 can cooled only ...	93	74	0·22	Sweet, with weedy flavour	37 ,,
1 can as milked	93	...	0·25	Rank smell	28 ,,
1 can aerated only ...	94	89	0·21	Sweet flavour	38½ ,,

Several other experiments have been carried out, and all have shown in a marked degree the effect of aeration in driving off odours of all kinds common to milk. In conducting the above tests, I have visited several dairy farms, and in all cases personally supervised the work, in order to ensure exactitude in every instance.

COOLING CREAM.

These experiments were devoted to the milk supply, but equally successful results have been obtained in the treatment of cream. For the cream vessels thick covers would be better adapted, as the absorptive water-power is greater and the cooling properties better illustrated. Factory managers would do well to organise a series of tests, using covers of different texture and characteristics, and I am confident the good ensuing from work of this kind would encourage an extension of experiments in other departments of dairying.

Let the following method of cooling cream, which has already appeared in the *Journal*, be tried wherever the necessary supply of water is procurable:—

Overhead erect a water tank, attached to which is an iron pipe, preferably gunmetal, perforated with small holes situated at short distances from each other. Underneath is a plain wooden stand, on which the cans are placed. The cans are of the ordinary shape, and when in use for cooling a specially constructed lid is employed with a tube on top 8 inches long, through which passes the handle of the stirrer. On the cans there are stout covers, made so as to be easily removed. From the pipe the drops of water are regulated so as to keep the cans continually moist.

Temperature of Cream and Skim Milk.

Temperature of air in the shade, 95 degrees Fahr.:—

—	BEFORE COOLING.		AFTER COOLING.		
	11 a.m.	2 p.m.	5 p.m.	8 p.m.	6 a.m., Next Morning.
	Degrees.	Degrees.	Degrees.	Degrees.	Degrees.
Cream—					
No. 1 can, full	82	74	68	67	61
No. 2 can, full	82	75	66	66	60
No. 3 can, full	80	74	67	66	60
No. 4 can, half-full ...	84	75	68	66	59
Skim milk, full	84	76	70	69	...
Water used	70	72	78	78	68

By the foregoing results it will be found that the average fall in temperature of the five cans during the first three hours was 10 degrees, the second 7 degrees, the third 1 degree, and from 8 p.m. to 6 a.m. 6 degrees, making in all 24 degrees. The enterprising farmer informed me that, had the day been warmer than 95 degrees, the temperature of the cream would have been lower: but on no occasion has he been compelled to churn the ripe cream at a higher temperature than 58 degrees Fahr. Milk and cream suppliers will find the cost of erection of cooler very little, all that is necessary in the shape of a building being low canvas walls of skeleton woodwork, and a feature of the system is its adaptability to the treatment of small supplies on the farms as well as a large number of cans. When the above system of cooling cannot be adopted in the preservation of milk, let the aerators now on sale be put into practice, all being efficient appliances for use on the farm.

A novel method of cooling dairy produce is to be seen on the farm of Mr. Bateman, of Laidley. This enterprising dairyman, with the able assistance of his wife, is working his farm on lines worthy of repetition wherever a cream separator is used. A simple device, comprising a circular stand of shelves, is erected in the dairy, over which is a canvas cover, the top part being submerged in a receptacle of limewater. By this means a constant circulation and evaporation of water goes on day and night. The higher the temperature the more moisture is given off, which correspondingly extracts the heat from the air inside of the stand, and thereby cools the stored produce and retards fermentation.

As already pointed out, it is to be deplored that the unnecessary exposure of cans of cream to the burning heat and sultry atmosphere of the summer months goes on uninterruptedly, and thousands of gallons of otherwise good cream fall a victim to the evil influences of bacterial life. It does not appear to be thoroughly grasped that, when cream has reached the proper degree of acidity for butter-making, one hour's extra keeping at a high temperature is enough to practically ruin the whole supply, and this is more closely illustrated in its disastrous form when the cream is not of the highest state of purity or freedom from hurtful agencies as taint-producing organisms. A knowledge of the subject of fermentation would give an insight into many so-called mysterious changes in dairy produce, and save a heavy deficit to the State.

Cooling Dairy Buildings.

In concluding the article, permit me to add a few lines on the above subject, hoping that the suggestion will meet with the approval of some of our managers and farmers, who will test its worth in a practical way.

Artificial cooling of cream, butter, and cheese rooms is absolutely essential to the successful manufacture of factory produce. But it is within the sphere of owners of small small factories suitably constructed and having long bare walls to keep the temperature down in the making-rooms, and also to lessen the work of refrigerating machinery in the following way:—

Erect 3 feet or 4 feet from the walls of the factory a cheap lattice frame, extending to the height of and joining the roof. Creeping plants, of robust constitution, having large green leaves, are planted, and the dense foliage, as it covers the lattice or trellis work, acts as a splendid protection against the evils of the sun's rays and heated atmosphere. The space between the thin dense hedge and the wooden walls of the factory is kept cool, which corresponds to the air space of the refrigerated chamber. I have been looking for a suitable creeper for some time, and have found one indigenous to the State and likely to give satisfaction, but it has not been named by those in the district where it is growing luxuriantly. If cream rooms on the dairy farms were partly underground, and the walls protected with plant growth as recommended, a much lower temperature would be maintained. In this case it would be still more effective to cover the whole building with the creeper, thus shading the roof as well as the walls. The erection of rough but strongly-built shelter sheds or

huts grown over with creepers in districts where cream is collected by drays sent round by the factories would be attended with some success. The custom is to leave cream supplies at the roadsides, exposed to the scorching heat of summer; and when the wagon arrives further exposure is given, as no awning or covering is usually provided in the construction of the conveyance.

NOTES UPON THE ANGORA GOAT.

The director of *Coleman's Rural World* has written the following upon the Angora goat, which, although referring to the industry in the State of Maine, will yet be of general interest to breeders of the Angora in Queensland:—

For three years the Maine Agricultural Experiment Station has been experimenting with the Angora goat, and sums up its experience as follows:—

Angora goats are quite hardy and thrifty, and can be kept on the same mountains 1 mile from home without the owner or anybody seeing to them for a week or two at a time, and none have been killed by dogs yet. A brushy range is best for goats. They certainly enjoy standing on their hind feet to eat. I have a good grade of Angora goats. That is the kind I advise everybody to begin with. Those with brushy land ought to have goats, even if they have to quit the cow. I have had the remark made to me by goat men that they wouldn't give a good nannie for the best cow they ever saw. The nannie will bring the most clear profit. The Angora is claimed to have a much finer meat than the common goat for fine eating, and is healthy. I would not swap it for all the bacon in the country. The money for mohair comes in very handy twice a year. The skins make excellent rugs. Wash them so as to get the hair clean, then stretch on a table or wall by tacking it fast; then scrape with some rather blunt tool (I use hog-scraper) until all the flesh is off. Let dry and then take down, cut away corners, line and trim edges with any kind of cloth and colour to suit. I prefer goatskins for rugs to remain stiff, but constant use makes them soft and pliable too soon. Skins tanned make good strings, and answer any purpose that buckskin will. Goats are very thrifty and lively, and can run you a good race, if they have access to shelter, if necessary to reach it before a storm.

Profits in Angora Goats.—The popularity of the Angora goats continues on the increase, and they are becoming the subject of conversation around the fireside in the rural home. They are as profitable as sheep, and sheep stand highest on the farm. Their fleece, called mohair, commands a ready sale, being manufactured into dress goods, braids, and plushes used in upholstering furniture and railway cars.

The meat of the Angora compares favourably with the best of mutton. Their pelts are tanned on the flesh side, leaving the long, curly hair on; can be made into rugs, dyed any colour, and worn as trimmings to ladies' apparel. The Angoras will clean up the weeds, briars, and undergrowth on a farm, and at the same time enrich the land. Pure bucks crossed upon the common goat will, in a few years, develop a valuable flock. Try breeding these beautiful animals.

The *Farm and Home* gives the following item, showing the extent of the business of importing goatskins. This does not include the fleece or mohair:—

Twenty-five million dollars expended largely in Asia for goatskins is money that ought to be saved at home. We have millions of acres that ought to be cleared of useless herbage and shrubbery; the Angora goat is the best tool to do this work.

Poultry.

NOVEL INCUBATOR.

Mr. H. Somerset Leeke, Kerangara, Fishergate, near Broadmount, sends us the following interesting description of an incubator which any farmer can easily construct for himself. It appears to be well worth a trial, being inexpensive, easily built, and requiring very little attention beyond turning the eggs daily:—

In the issue of the —— journal for the current month, I note "Hints on Working an Incubator," taken from the *Agricultural Gazette*, London, and I have followed very carefully for some years the articles, hints, &c., on poultry given in our own *Journal* from time to time. Artificial incubation has been a hobby with me for many years, running back to the time when as a small boy I planted eggs in the cucumber frames in my father's garden in England, much to the dismay of the gardener. I have used various descriptions of incubators, some of them home-made, but chiefly "Hearson's," with more or less success, and the chief aim all through was to guard against vibration, that being, so far as my experience goes, one of the main causes of either total or partial failure, everything else being right, such as eggs fresh, temperature steady, and moisture sufficient. Still over and over again I have failed to hatch a fair percentage of eggs, and I have always placed the cause to excess of vibration. These failures, extending over twenty years, set me thinking, and it being a matter of history that the Egyptians and Chinese have been from time immemorial using "ovens," a detailed description of which I could never succeed in obtaining, I determined to try what I could do on those lines. It will, I think, be generally admitted by those who have used incubators to any extent that, in handling eggs during the period of incubation, one's senses, if I may use the term, gain in sensibility, and it is quite possible by mere handling of the egg a short time after it has been in the incubator to say with a fair amount of certainty if it will hatch or not without further testing. It has been frequently stated that the secrets of the Egyptian process were jealously guarded and handed on from father to son, but I have, I think, proved, certainly to my own satisfaction, that there were no secrets to guard, the only thing being attention to details and regularity in their performance, together with the development of the sense of touch caused by handling large numbers of eggs in semi-darkness. If we refer to Nature for help, we have the scrub turkey, the snake, iguana, alligator, and turtle to watch and learn from; and I have watched them all in turn, and tested their eggs, and taken the temperature of their nests on various occasions as opportunity offered, taking careful notes for future use, as I have always held that what the Egyptian could do I could, and I claim that I have solved the problem of artificial incubation, doing away with capsules, ventilators, water-trays, egg-drawers, &c., retaining only the thermometer and lamp, and thus reducing the expenses down to the bare cost of fuel and labour.

Poultry-raising, both from the fancier's point of view and for market purposes, is not successful nowadays without some system of artificial incubation, but the initial cost of incubators, and the time and trouble attendant on their use, has debarred many from entering on what is really a remunerative business, and is a pursuit eminently suited to those amongst us who are unfitted for hard work. I have found poultry men or those who suffer from "hen fever" always willing to show and tell each other what they know, and a short description of my oven may be of interest to the "clan."

My incubator consists of a pit 4 feet deep, 6 feet wide, and 8 feet long. This is slabbed all round and roofed over with plain galvanised iron, laid flat,

and all the earth taken out is piled over the top. The entrance is through a tunnel 10 or 12 feet long, built in the same way, and having a close-fitting door at each end, the floor being left unslabbed, just the earth levelled; inside are two rows of shelves running right round—the top shelf 14 inches from the roof, and the undershelf 12 inches below that. These shelves are best made of pine lattice laid lengthwise, ½ inch apart and 15 inches wide, having a rail or edge all round, and divided off crosswise about every 2 feet. The lamp I have found most serviceable and at the same time economical is the ordinary round-wick reading lamp, which can be purchased usually for about 3s. I take the whole burner off and solder it on to a tin of kerosene, laid on its side, and by using a wick long enough to reach the bottom of the tin I find the lamp will burn steadily and require practically no trimming, once a week being often enough. As the oil is consumed I fill the tin with water through a hole punched further along the tin, and stopped with a cork. Should the lamp burn dim, one or two small nail-holes will give ventilation, but it is not always needed. I use four ordinary floating dairy thermometers, two hung about 4 inches from the roof at either end, the lamp being on a stand 18 inches high in the middle of the room, and for the sake of reference only two hung under the bottom shelves. The upper thermometers give the temperature over the eggs, and the others the ground temperature. As a rule the temperature does not vary much on the ground, 5 degrees covering the variation, while the upper temperature will vary nearly 20 degrees—*i.e.*, from 90 degrees to 107 or 108 degrees, being steadiest at about 100 degrees. I have had successful hatching at a temperature of 97 to 98 degrees, but a little higher is better. The eggs should be turned once a day, and the inner door of the tunnel left open while this is going on, usually occupying about an hour, but the time will depend on the number of eggs one has to handle, and a room of this size will contain 2,000 hen eggs, more or less, when all the shelves are full: but, except you have a large number of laying hens, it is not easy to obtain the required number of eggs fresh, and it is well known that an egg cannot be too fresh; in fact, I have found that eggs taken from the hen and placed in the incubator while still warm will usually hatch on the seventeenth day. The lamp, or rather tin of kerosene, will just last three weeks, but can be easily refilled. I cannot enter here into details of the various stages an egg passes through during the process of incubation, as I am afraid this article is already too long, but will be pleased to answer any questions on the matter, so far as I am able, either through the *Journal* or by letter.

My incubator is at present dismantled, having caught fire through my own carelessness; but anyone who will try incubation on these lines will, with ordinary care, be more than pleased with the result.

[With regard to the Egyptian "secret," Mr. Leeke is, we think, quite right in believing there is no secret about the incubation business in Egypt. In 1858, when at Cairo, we came across a naked young Egyptian sitting in front of a kind of "humpie" covered with matting. He went inside and squatted amongst some hundreds of eggs lying on the hot sand, and employed himself lazily in turning them. We had never heard then of incubators, but, as he told us, "Chicken come soon," we concluded that this was an Egyptian hatchery. How the sand kept up its temperature in the hut, we never thought of inquiring. Probably, as the climate is very hot, the place was opened during some part of the day.—Ed. *Q.A.J.*]

MATING BIRDS.

Poultry has the following on the subject of using a purebred cock with common hens and the increase in the egg production of the progeny:—In the autumn of 1893 the Countess of Aberdeen made a tour through Ireland, accompanied by Mr Ed. Brown, F.L.S., a poultry expert. Mr. Brown delivered

lectures and gave practical advice in several of the localities visited. The Countess sent purebred cocks to run with the native fowls, and in 1897 a Mrs. Gibson reports as follows on the experiment:—"The facts which I mentioned are that within the last twelve months the increased money value of the eggs produced in this district—*i.e.*, within a radius of 35 miles from Limerick—is fully 30 per cent. That industry used to have a turnover of £12,000 to £13,000 a year (the actual payments by the merchants for the eggs). Last twelve months their payments have exceeded £16,000. The immense stimulus given to this, essentially a cottage industry, by the action of the Countess will be better understood when I tell you the price of eggs has fallen fully 20 per cent.; so, to have the increased money return of 30 per cent., there must have been an increase in the production of 50 per cent. One man largely engaged in the trade puts the actual increase in production at fully 100 per cent. He produced his books and let me have the figures for month after month to compare. Three years ago the price of three and four month old chickens ranged from 1s. to 1s. 2d. each, the greater number being sold at 8d. and 9d., and they were dear at the money. Now 1s. 3d. is a low price, and 1s. 6d. and 2s. quite common, and they are cheap at the increased price. I am understating the case when I say that, in this district, the action of the Countess, in helping this one branch of cottage industry, has brought into the homes of the cottagers and small farmers at least £20,000 sterling more money during the past twelve months than they ever earned by it any other year within my memory."

DANISH *V.* BRITISH BUTTER IN GREAT BRITAIN.

Mr. Arthur Byford, Kolan River, Bundaberg, takes exception to the following paragraph, which appeared in an article on the "Export of Butter," by Mr. G. S. Thomson, in the June issue of this *Journal:*—"So well has Denmark studied the wants of the British consumer that instances are common of the small farmer in England buying the Danish article and selling the supply of his own farm locally."

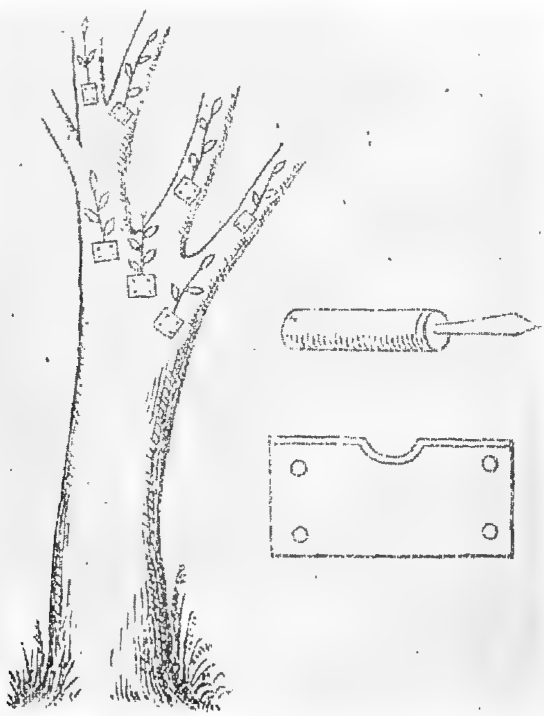
"That statement," says Mr. Byford, "has only a shadow of truth about it, if as much as that, and it is very misleading, an insult to English farmers. Having spent about a quarter of a century of my time in England living in five different counties and in village, town, and city, I will explain the matter. The English farmer, having kept enough of his own butter for eating purposes, can sell the balance at 1s. 6d. to 1s. 8d. per lb. as fresh butter; he can get lard from the grocer at 6d. and 8d. per lb., or salt butter from 1s. to 1s. 5d. per lb.; and the butter that he buys is for cooking purposes, and certainly not because he prefers the Danish article and thinks it better than that made by his wife, daughter, or servant. An odd case might possibly be found of a farmer selling all his own butter for the sake of the extra money, and buying something cheaper, but I have never known of such a case; it is not the farmer who buys Danish butter or New Zealand mutton, for he looks upon them as enemies, but it is the poor people in town, who are glad to get them, as they cost less money. If the price is to decide the quality of butter in England, then the English is on top, next comes the Irish, and the stuff from Denmark is third quality."

Mr. Thomson, in support of his statement, says:—"For reliability and general quality, Danish butter holds the highest place in the British market. The word 'England' is certainly misleading in the sentence referred to by Mr. Byford. It should have been 'Great Britain.' My travels in Great Britain, less than two years ago, convinced me of the accuracy of a statement similar to the above which was brought before my notice in the colonies. We are striving to attain success equal to that of Denmark in the home markets and win the confidence of the British consumer."

The Orchard.

A NEW METHOD OF BUDDING.

Mr. J. Bell, of Balmain, New South Wales, has written to the Department of Agriculture to describe a new method of budding devised by him. In his letter he says that his method was totally unknown to the Government Botanist and Fruit Expert, both of whom had expressed their appreciation of the discovery, and had promised to make it known to orchardists and others that it might interest. The *Australian Field* writes on the subject:—"An interesting experiment by Mr. J. Bell, of Balmain, has led to the discovery of a simple and highly successful method of budding. The procedure is thus described by Mr. Bell:—'I have a large peach-tree in my yard, measuring 23 inches in circumference at the base, and at 6 feet from the ground 18½ inches. It is ten years old, and last year I experimented with it as follows:—I sharpened a piece of bone to the shape of a lead pencil, and fixed it in a handle, providing a tool like a large carpenter's awl. The handle of a tooth-brush will answer as well as anything, and by putting a handle on it may be driven with a hammer into the bark. Bone will not "turn" the sap like steel or iron. After making a sufficient hole in the bark I insert the bud, and then tack a piece of leather on to keep it in its place, using upholsterers' half-inch gimp pins, which, being enamelled, do not rust. Several buds were so treated, and when they swelled the tacks were loosened, so that the leather could be removed easily. Wedge grafts of 6 inches were done in the same way, but I found that on my tree the buds grew much more quickly and stronger than the grafts. I inserted eleven buds of three different varieties of the peach on this tree, and they are all bearing large and excellent fruit this season, some of the buds having as many as sixty fine peaches. I would recommend the adoption of this method for all old trees requiring new wood, an advantage being that it does not interfere with the tree bearing fruit while the buds are being matured. No string or clay or grafting-wax is required, as with the old system.'



NEW METHOD OF BUDDING.

"The accompanying illustrations show respectively the tree which has proved the efficacy of the method, and the diagram representing the awl and the correct way to tack the leather on the buds.

"This method can be applied to the old T system of budding by tacking wet sole leather over the buds, with space for its growth, instead of using string, &c. First puncture holes in the leather for the gimp pins, so as not to bruise the bark or bud. The proper time is when the sap is full and bark will strip easily."

Mr. Despiessis, the horticultural and viticultural expert of the Department of Agriculture of this State, in speaking of the above method, states:—"This is an interesting application of the methods of budding—grafting. Cutting the tree back and operating on the young shoots in the usual way would, of course, result in a better knitting of the scion and stock. In Mr. Bell's method, however, the point which is worthy of attention is that the productiveness of the tree is not interrupted."

Vegetable Pathology.

THE PINEAPPLE DISEASE.

By H. T.

In 1887 the growers of pineapples at Nundah, including in this district Eagle Junction, Nudgee, and Zillmere, became greatly concerned on discovering that these plants were failing, and this in spite of all effort to obviate so undesirable a contingency. And they even anticipated that the pine orchards there would be extinguished if this affection continued to spread as rapidly and as extensively as it had recently done. These expectations have not been realised; but nevertheless pineapple-growers have in some instances ever since then experienced by reason of its occurrence considerable annual loss, and even—though rarely, it is true—have been compelled to abandon what promised to be a lucrative horticultural pursuit. Fortunately, too, the malady complained of has not shown itself to be general in the district, and even those growers who have had to lament its presence are already persuaded that, as has happened in the past and so may transpire in the future, their cultivations will become free of it. All notwithstanding will welcome an exposition of its true nature and of the circumstances which determine its capricious occurrence at particular seasons and in definite and special localities.

THE DISEASE.

To commence with a description of its leading characteristics, it may be remarked that pineapples when affected by the disease in question present the following distinctive features:—Their ordinary somewhat darkish-green hue gives place to one in which red and yellow colours predominate; or, owing to the wilting and twisting of the leaves from their points downwards, a brownish tint pervades the plantations. If the disease is already well established it will be noticed that the rows in which the pines have been planted have their evenness disturbed by the occurrence of stunted and discoloured plants, even if they are not interrupted—as is often the case—by gaps which either lack the presence of plants or are already occupied with such as are of younger growth, with which the diseased ones have been replaced. Again, a row of pineapple plants, in other respects presenting the appearances characteristic of health, will by the presence of one or more pale-green areas still manifest a partial injury here and there. Somewhat similar effects may arise from defective cultivation, poverty of soil, or from the occurrence of either frost or cold winds, notwithstanding the phenomena traceable to these causes are abundantly distinct, especially when regard is had to the appearance due to the presence of the disease manifested by the individual plant. In this it will be observed that the leaves have lost, to a certain extent, their usual turgidity; that they lack the full rigidity so characteristic a feature in the leaves of the

healthy pineapple plant; and if they bear fruit at all, this has either already assumed a yellowish hue long prior to the time when under ordinary circumstances it should do so, as judged by its dimensions, and is in fact both stunted and etiolated. As usually happens, however, there are far more pronounced symptoms of decadence, for the plant has commenced to both die back and become rotten. The apical leaves and shoots have either already fallen away, or may readily be removed *en masse* by the hand, for, as may easily be observed, they are already decayed at their bases of attachment. At other times, again, in an affected plant a "sucker" or secondary branch merely becomes pinched off, so to speak, from its parent stem, the tissue at its base having first rotted and then become shrunken and discoloured. On lifting from the ground a plant presenting these symptoms, it will be found that the roots proper and rootlets are already dead and in an advanced stage of decay, and that no new ones are succeeding them. A longitudinal section through a pineapple plant in which the disease is not far advanced reveals the fact that as regards its external manifestation decay has commenced at the growing apex, proceeding thence downwards into the stem. Further inquiry will render it evident that very early in the history of the disease, and even when these external symptoms are still unmanifested, the roots or rootlets have already perished.

CAUSE.

1. *Special.*—From the foregoing statement regarding the character of the disease it will be apparent that it is primarily one originating in the roots, and that the death of the plant and the external symptoms which herald it are immediately due to its connection with the soil being severed through loss of these organs. The discovery, therefore, of its true cause thus resolves itself into one of finding that through the operation of which the loss of the roots is occasioned. To accomplish this it is necessary to examine a long series of plants, one term of which shall include ones exhibiting the general characters such as are described as those of the disease, and the other plants that are outwardly healthy, but have their roots, though intact, commencing to perish, whilst the intermediate members of the series represent gradually augmenting stages of the disease. The difficulty of the investigation consists in finding such a series, and being at the same time persuaded that they illustrate stages in the progress of the disease.

In the earliest indication of root disturbance encountered both roots and rootlets are normal in appearance, but the microscopic hairs which so thickly clothe them, instead of being obtusely pointed simple cylinders, are terminally irregularly widened and twisted—in fact are conspicuously clubbed, and the terminal widened portion contains some apparently inorganised granular matter. (The connection of this condition in the plant with those hereafter described is rather inferred than proved. Any abnormal condition of the organs through which, in the first instance, the essential food material is ingested must, however, act prejudicially to the plant exhibiting it; but, though this abnormal condition of the root-hairs has been discovered in plants undoubtedly diseased, it must be admitted that it has been also observed in such as have been derived from a plantation to all appearances perfectly unaffected, and again it is not seldom absent in even diseased plants.) Then as an illustration of further development, the pineapple plant has its roots and rootlets discoloured at their tips, and tending to collapse on pressure in this situation. Then occur plants the roots of which are terminally pale-brown, collapsing readily on pressure, instead of being white and resilient. As a further stage in the progress of the affection a plant has all its young roots as in the last-mentioned one, but the abnormal condition has extended upwards along their course, until those with woody central bundles are similarly implicated. Then finally we meet with plants in which the roots are all decayed. On submitting the roots described as illustrating the second and subsequent stages to microscopical examination it is found that a special

fungus in different conditions of growth occupies the tissue intervening between the central bundle and the external wall, and that its growth is attended by a complete breaking down of the tissue which supports it. This fungus, which is colourless, consists essentially of an intricate network of mycelium supporting here and there conidia or spores. These conidia may be simple, but are usually composed of two rounded elements, each having a double contour. They may be almost sessile upon the threads of the mycelium, or supported on slender pedicels of greater or less length. They are also readily detachable, and in fact generally occur free amongst the mycelium, and may even be met with within the vessels traversing the root tissue. This fungus which accompanies the discolouration and softening of the roots alluded to without doubt effects it, and in fact must be regarded to be the active cause of the disease.

2. *Contributing.*—If suckers derived from badly affected plants, and which are themselves even rotten at their bases, are planted under certain conditions as regards soil, they will not exhibit the disease on becoming established, and will, moreover, produce healthy plants. This fact, which points to the conclusion that the disease is not necessarily hereditary, has been experimentally demonstrated, amongst others, by Mr. R. Sumner, who planted such suckers upon friable soil resting upon a gravel bed, with good results. Again, the disease occurs quite spontaneously in plantations without any circumstance existing to favour the supposition that it has originated through infection. Further, it cannot be communicated at all or only exceptionally. Again, roots may commence to decay in the manner indicated, and then the process stop, new lateral offsets arising to take on the functions of those organs which they replace. Thus it would appear that the inception and continuance of the disease is determined by certain conditions apart from those furnished by the plant itself. Amongst the circumstances possibly contributing to this result, may be mentioned (1) adherence to the stock from a single source with inbreeding as a consequence; (2) neglect of renewal of plants in individual plantations; (3) continued cropping of the ground with one kind of plant; (4) imperfect methods in planting, cultivating, and manuring crops; (5) influence due to climate and seasonal changes thereon; and (6) those residing in the character of the soil and its drainage. The Nundah district (including Nudgee, Eagle Junction, and Zillmere) fortunately affords every opportunity for estimating the effect, if any, of these influences in determining the presence or absence, or in affecting the degree of virulence, of this pineapple disease. In fact it may be regarded as one immense experiment station for testing the growth of this plant. In it the plant is cultivated in situations varying in the extent to which they are exposed to cold, in their geographical aspect, in their surface contour, in the physical and chemical composition of their soil and subsoil, and in their superficial and subsoil drainage. Some plantations have been under cultivation for many years in succession, either with the same crop or with a succession of different crops; others again are on virgin soil but recently broken up. Then as regards cultivation, the planters as a whole adhere to no system, but are guided each one by his own experience; and thus whilst primitive procedures are followed by some, others again pursue methods which can be but little improved upon. We meet with artificial drainage or note its absence, deep or shallow cultivation in preparing the plant bed, the use of scions derived from different parts of their parents, the suckers "cleaned" to a varying extent, planted contiguous to or remote from one another and with or without manure, and material yielded by a wide range of substances composing the latter, and so on. To estimate separately the effect of these conditions it may be remarked that some of the oldest growers are of opinion that the pineapple plants, as being the progeny of one stock, are in gradual process of deterioration, and that therefore it would be advantageous to introduce fresh plants into the district from some pineapple-growing country remote from the State, it being assumed either that the presence of this disease connotes the existence of some general inherent and gradually

accumulating weakening in the plants, or that an impaired vitality is manifested, and this altered constitution affords an opportunity for the incursion of an ailment which would otherwise be withstood. More than one grower has stated that in years gone by the fruit of the ordinary rough-leaved pines attained a greater average dimension and weight than happens now. Others, however, allege that any better quality originally exhibited is traceable to the greater attention which was then bestowed upon their cultivation, a state of things resulting from the fact that the holdings were then of comparatively small dimensions and could be easily overlooked, and the high price secured for the crop admitted of a greater outlay for labour than is now admissible. But however this debated point may be finally settled, it may be remarked that had the pineapple plants been all derived from one stock the variations of the soil at Nundah are so great that they have already been subjected to all the more important influences—save that of climate—which it may reasonably be assumed are exerted by different and widely separated or remote habitats. As a matter of fact, however, plants from remote localities have from time to time been introduced, yet without such results following their introduction as the advocates of "new stock" are wont to anticipate. Mr. J. Melton some years since imported a few "prickly-leaved pines" from Fiji, but these did not succeed so well nor approach the perfection attained by the pineapple plants already in his cultivation. Again, Mr. A. Atthow some five years since procured, also from Fiji, a number of pineapple suckers, and these he propagated largely, but yet without any promise of exceptional results. In the latter case, however, it must be admitted that some two-year-old plants from this Fiji stock are scarcely to be distinguished from the ordinary pines of the district, with which they are grown in alternate rows, though these have a year's growth in their favour. This precocity is, however, soon obliterated as the plants become older, and seems to affect only the vegetative organs. The Rev. F. J. A. Rodé and others formerly grew the true Prickly Queen, which they introduced subsequent to the original stock, but found it inferior in every respect to the rough-leaved pineapple which forms the bulk of this plant in cultivation at Nundah. And to come nearer home, plants have been derived from Rockhampton, New Farm, and St. Lucia Estate. In connection, too, with this reported deterioration of the pineapple plants grown in the Nundah district it is not without interest to discover the whence of the original stock; and, this being so, it is hoped that some local antiquarian having proclivities in the direction of this special line of research will deem the matter not unworthy of his attention. In 1837 the postmaster of the Moreton Bay settlement grew pines in Brisbane, and was indeed the first to ship this fruit to Sydney. From him, too, were obtained the plants which the Moravian missionary, the Rev. F. J. A. Rodé, grew upwards of fifty years since on what is now Melton's Hill at Nundah. In 1849 his colleague, Mr. Wagner, had also pineapple plants at the same spot, and shortly afterwards—in 1851—as Mr. Melton informs the writer, Mr. Gerler had pines well established at Eagle Farm, Mr. Skyring at his farm in Fortitude Valley (near where the Convent has since been erected), and Mr. Surveyor Warner at Kangaroo Point. Whether these, too, were derived from the postmaster's original stock has not been ascertained. Mr. Gerler's plantation was, however, the principal source for further cultivation of the plant. Up to this time only the rough-leaved variety had been grown here. But some twenty-five years since the late Isaac Stuckey, whose grandson is the well-known and successful pineapple-grower at Eagle Junction, and my informant as to these particulars, purchased some fruit of the smooth-leaved variety which had recently been imported to Brisbane, and, finding a pine new to his experience, planted the tops, and afterwards, by using all the material—tops, suckers, butts, &c.— available for propagation, was enabled to supply also other cultivators. Admitting, however, that the bulk of the pineapples grown have been derived from one stock, the evidence that they have generally declined in vigour is but equivocal, and there is nothing to point to the conclusion that the circumstance is in any way connected with the disease.

The same remark applies to longevity in the case of particular plants, as also to continuance of the soil in crop to the same plant for a number of years. Adjoining Mr. Melton's plantation at Nundah is that of Mr. Rodé. Here there are pineapple plants at least thirty years of age, and yet showing no symptoms of disease. Similarly, Mr. Connah has pines the perfection of health which are twelve years old. Mr. Isaac Stuckey, of Eagle Farm, can point out in his cultivation pines which have been growing in one spot for ten years, and are yet free from disease. These plants it must be admitted have, however, every appearance of lacking vigour, but under the conditions under which they are grown it is almost impossible to apply fertilisers to them with likelihood of beneficial results. Pineapple plants are at perfection, as regards the quality of the fruit they yield, when two, three, and four years old, and thus it is that many advocate, with much wisdom, their being rooted out and replaced before becoming older. The practice, however, in the Nundah district is to retain where practicable these plants in the ground for almost as many score years. In this case they are in the first instance planted in rows 8 feet or more apart; these rows being suffered to increase in breadth till adjacent ones touch, and when a path can no longer be preserved between one row and another by clipping the encroaching leaves, to take out the intermediate rows, leaving the others to sustain the crop. By this means it is found a numerically stronger and bulkier harvest is secured, though the size of the individual pines is not so large as might otherwise be, but what is an important consideration, less labour is required, and so a larger acreage can be profitably occupied by a single landholder. But the quality of the product should be the first consideration with the horticulturist. In some of these old plantations the disease has been rampant, but by no means in all, and wherever it has manifested its presence in them this is explicable on considerations apart from such as relate to continued cropping and to longevity of individual plants. Commonly, however, the disease selects the young plants in preference to the old, and this circumstance is similarly accounted for, also must not be forgotten that the critical period in the life of the pineapple is during the second and third years of its existence. In one instance of the occurrence of the disease 11 acres were under pines; the plants had been put in from two months to five years since; in some spots the plants had been renewed three times in succession owing to incursion of the disease, and the latter had necessitated 3 acres being taken out in one spot and 2 in another. The disease occurred in plants of all ages. The soil in this instance was virgin, and was of a light sandy texture, passing into clay beneath, and held moisture well even on the slope.

The method of treatment of individual plants, whether as suckers still unplanted or after they have become well established in the ground, has been held to be accountable for the presence of the disease, but there are no grounds for this opinion, and so many methods are pursued, some commendable and others again reprehensible, that if it were so the fact would be soon discovered after such a general survey as has resulted in the conclusions now set forth. Some planters are said to remove too many dead leaves from the bases of these suckers, in other words "clean" them too well; others are blamed for setting them too closely together. But both of these procedures can be justified on physiological grounds. Mr. I. Stuckey, of Eagle Farm, both cleans his suckers well, clips their leaves, and plants them in contiguity, and no plantation in the district—except possibly one or two at Nudgee—can show results equal to those which he has attained. A former employee of his, having imbibed his doctrine, does as he has done. Yet his cultivation is visited by the scourge; but then his pines are subjected to quite different conditions—especially as regards soil.

The employment of fertilising agents may again be regarded as influencing the presence of the disease. Their use is very general in the Nundah district, and, moreover, is seen to be especially demanded even in the best soils, since

wherever they have been withheld the plants soon exhibit all the appearances symptomatic of impoverished condition. They are small, and lack the bright-green hue of vigorous growth, and they bear but little fruit, and that of small size; but, notwithstanding, these depauperated plants are not those that develop as a rule the disease under consideration. On the other hand, plants brought to a high condition of growth and fertility by artificial enrichment of the soil are the first to succumb to the disease when other conditions favour its presence. Amongst the numerous manurial agents availed of may be instanced stable manure, the litter being either straw, bush hay, or sawdust, stockyard manure, pig manure, horse manure, cowdung manure, the refuse from slaughter-houses composed largely of vegetable matter, that of tanyards—especially lime and hair—and exceptionally bonedust and artificial composts. It is beyond the scope of this article to deal with the methods employed in applying these substances, either in preparing the ground for planting, or at different stages in the growth of the plant itself. The subject, however, is introduced for the purpose of pointing out that there is no evident connection between this diseased condition and the use of manures in general, or indeed the employment of any special one. It must be remarked, however, in this connection that the usual ill-effects due to the improper use of manure are observable in the district as elsewhere. In some instances it is placed immediately beneath growing plants, when it either through being still "hot" causes irritation, or being of the nature of an absorbent, like sawdust, and intercepting nearly all moisture from below or—when placed amongst the plants—nearly all rain from above, so again acts prejudicially. But the ill-effects due to these causes are characteristic and, therefore, easily recognisable. It may in this connection be profitable to remark that there is a general tendency to resort to bulky substances and to those of doubtful efficacy in effecting this amelioration of the soil. Sawdust moist with ammoniacal liquid in which the ammonia is unfixed quickly on exposure becomes of little value; cow manure and other such substances afford the means of introducing undesirable weeds, and though they may determine considerable root growth, the stimulation to which this is due is not nearly so long continued as would be the case were bonedust employed. The cost of haulage is an important consideration, and therefore it is profitable for the pineapple-growers to be reminded that, as has been elsewhere remarked, it takes 40 tons of good dung and straw to be equal in effect to from 14 cwt. to 16 cwt. of specially prepared mineral manure. It is possibly not superfluous to point out, too, that an artificial manure has further distinct advantages, since for a given soil and crop one fertilising agent is preferable before all others, and it becomes therefore possible in using such to avail oneself of just that one which may be employed with the greatest prospect of good results. In the Nundah district there are several distinct classes of soil, and as yet, whilst their constituent elements have not been severally determined, it is impracticable to indicate the special manure through the employment of which the best results will be attained.

In reference to the soil on which the pineapples are grown, it may be remarked that this varies greatly in different plantations, and oftentimes even within the limits of but a small area more than one description may be met with. This variability extends to all its leading physical properties, including homogeneity, state of aggregation, capillarity, absorptive capacity, and colour. Amongst varieties exhibited may be enumerated (1) a reddish-brown or red loose deep soil, with or without small ironstones, resting upon an open ferruginous "cement"; (2) a pale clayey loam, with or without fragmentary quartz, reposing on quartz gravel; (3) a rich open loam of considerable depth, containing little free sand; (4) a loam of some depth, in which sand occurs conspicuously throughout, and which gradates downwards into a stiff clay; (5) a shallow sandy loam, with clay subsoil; (6) soil of good depth, largely composed of sand, becoming paler downwards and resting upon clay; (7) a more or less argillaceous shallow soil (18 inches), resting on clay; (8) pale-coloured clayey loam, but 1 inch to 6 inches deep, resting upon clay.

The influence of the soil cannot, however, profitably be considered without reference to the natural drainage of the land; but this is almost as variable in character as is the soil itself, and even where the superficial contour would bespeak perfection in this respect the opposite condition prevails. For the many local geological disturbances which are so marked a feature in the Nundah district have effected not only great diversity of soil, but an inconformability between the superficial and subjacent strata, and consequently, moreover, a trend in the flow of subterranean water other than would occur in the absence of these potent influences, or in other words a frequent absence of correspondence between surface and subsoil drainage. Thus the summits and slopes of elevated ground are often especially noteworthy as being ill-drained. The presence also of an impervious clay subsoil, either just beneath the surface or when deeper situated connected therewith by a medium—such as sand—favouring capillarity, conditions commonly met with in the district, is also accountable for the occurrence of numerous naturally ill-drained plantations. Until recently no attempt has been made to counteract this obstacle to successful agriculture by artificial drainage, but now the presence of the pineapple disease has suggested the expediency of no longer deferring the operation. But is this affection in any way connected with the character of the soil or its condition as regards drainage? Under natural circumstances, as has been remarked, the wild plants of a dry field will be very different in kind from those in which the soil is wet, especially if the soil in the latter is an argillaceous or clayey one; again, the plants supported by a sandy soil differ from those of a calcareous one. In other words, the chemical and physical nature of the soil largely determines the quality of the vegetation which it supports. Nature, it might be supposed, would therefore oppose the attempt to cultivate one and the same plant on different soils and variously conditioned ones. And a study of the particulars relating to the distribution of occurrence of the disease under consideration supports the conclusion that it is but the expression of this opposition in the case of the pineapple plant as grown in the Nundah district. Where no other conditions obtain which tend to impair the healthy vitality of almost any plant, but especially the pineapple, it may be observed that certain classes of soil especially favour the presence of the disease—namely, those in which the water remains near the surface, either (1) owing to its inability to percolate to lower levels by reason of the presence of an impervious subsoil, or (2) too ready connection with lower water-bearing strata owing to some special property in the subsoil facilitating capillarity, such as occurs when a light soil gradates into a subsoil almost wholly arenaceous. Thus there are two different classes of soil in which plants subject to the disease occur, a circumstance which has given rise to the opinion that the character of the soil in no way influences its presence. Abundant evidence, however, confirms the opposite conclusion. Thus cultivations in which the disease is general have their soil answering to the descriptions of Nos. 5, 6, 7, and 8, and to a less extent No. 4; whereas soils Nos. 1, 2, and 3 grow pineapples free from disease. Instructive evidence in support of this attributed influence of the soil is afforded by two neighbouring selections, now occupied by Mr. H. Bilsen and Mr. J. Bowden respectively, on the Nundah-Zillmere road. In the case of each of these we have the soil largely composed of clay; but a deep deposit of gravel or fine conglomerate, similar to that exposed in the quarry close at hand, underlies continuously a portion of both; and the pineapple plants over it are the very picture of health. But as we proceed beyond the limits of the gravelly subsoil, and reach to where it is replaced by clay, the plants look unhealthy and are diseased in patches, especially where the soil is shallow. Again, at Nudgee, where the red soil is deeply underlain by an open subsoil composed of cemented grit or gravel, the plants are healthy almost without exception. Amongst these exceptions we may take the significant instance afforded by the plantation of Mr. Atthow. The greater part of this, where the ordinary soil of the neighbourhood prevails, is in perfect condition as regards the pineapple plants; but on a small portion of the selection extending towards the south, where the porous subsoil is

replaced by one of clay, and on an adjoining selection still further beyond, where the subsoil also is of the same description, the plants are rapidly failing. The influence, however, exerted by an impervious subsoil is minimised or even rendered inoperative in cases where the overlying soil is of some depth. In some cultivations the disease is restricted in its occurrence to small isolated or to larger but fairly well circumscribed areas, and wherever this is so its presence is traceable to the influence of a wet or sour bottom at no great depth from the surface, or to some other purely local condition equally efficient in preventing the escape of surface or subsoil drainage.

This very obvious connection between the presence of the disease and the condition of the soil and subsoil in which the pineapples exhibiting it are grown is also supported by what is known of the life habits of the plant itself. The pineapple will even grow in water, but this must be well aerated and contain no poisonous principle. Barchwitz as long ago as 1751, in his "Ost-Indische Reisebeschreibung," when writing concerning Lethy and other south-western islands, states that the pineapple "grows readily besides streams and in wet places." It is also partial to a humid atmosphere, and thus even succeeds well on almost all the islands near Singapore, where a dank climate constantly prevails. A wet soil or subsoil connotes the presence of something more than pure water, and this acts as an irritant to the roots and contributes to their disorganisation, though this is ultimately effected by a parasitic organism.

The history of the disease supports the conclusion that the baneful effects of unsuitable soil can alone be exerted when special meteorological conditions obtain. Mr. Bridges, of Zillmere, who has been pineapple-growing in the district all his life, being born amongst pineapples at Nundah, informs me that he has been long familiar with the disease, and that it is "nothing new" to him. Quite fifteen years since he had seen plants similarly affected after rain, though the disease was by no means so general then, being only met with here and there. Others have given similar testimony. An inciting cause in all cases is undoubtedly unusually cold weather, accompanied by an excessive downpour of rain—a very rare meteorological event for some years prior to 1887, which was the first occasion on which nearly all the pineapple plantations located on unsuitable soils, and which in many cases had but recently been established, experienced it. In this year there was excessive precipitation both in July and August, with the prevalence of a low thermometer, and the disease was first brought under public notice in September and October following. Again the heavy rains of March, 1892, brought a renewed outbreak of the disease in July and August of that year. And such instances of this connection might be multiplied. It thus happens that some of the soils, though when wet weather prevails they determine owing to their excessive moisture the presence of the disease, are especially suitable for the growth of the pine, and yield heavy crops in times of drought, and this is especially the case when the impervious clay pan is some depth from the surface. All soils are, however, improved as far as relates to the growth of the pineapple plant by artificial drainage, and disease will in many cases give place to healthy growth wherever this is properly carried out. This essential to successful agriculture already claims the attention of the Nundah pineapple-growers, and even though the inception of this operation has been delayed till after the disease has manifested itself its beneficial influence is already widely felt. The growth of pineapples on heavy shallow soils resting on clay should, wherever practicable, be abandoned, but even in their case some benefit may be derived by surface drainage, which is best effected by planting along the summit of an elevation caused by throwing the furrows in ploughing, so that those on opposite sides of a row are inclined to one another, and keeping this row well hilled up. It must, however, be borne in mind that the pineapple plant often sends its roots to a depth of 2 feet in quest of food material.

The conclusion of the whole matter is then that the disease of the pineapple plant is caused by a special fungus which lives at the expense of and so destroys the roots, a fungus which is secondary, the injury being primarily occasioned by the soil not being in a condition for healthy growth.

Viticulture.

SOME VINE DISEASES.

By ALBERT H. BENSON.

In the December number of the *Agricultural Journal* for 1903 there is an article of mine dealing with the destruction of fruit pests attacking fruit and fruit trees of various kinds, but not including vine diseases, as this matter had been dealt with from time to time in the *Journal* by Mr. E. H. Rainford, the late viticulturist to this Department. The supply of Mr. Rainford's pamphlets having become exhausted, and there being constant inquiries from beginners and others who have neither Mr. Rainford's pamphlets nor the numbers of the *Journal* in which they appeared, I am of opinion that it is advisable to again bring this matter before the vine-growers of Queensland.

Vines, like fruit trees, are liable to the attack of both insect and fungus pests, and a knowledge of these different pests, and of the best methods of dealing with them, is of very great importance to vine-growers.

The insect pests attacking vines are of many different kinds, and the damage done by them depends on the insects causing the damage. Thus, some insects injure the vine by actually eating the leaves, bark, or stems of the fruit bunches; others injure the vine by boring into it, either into the roots, stem, or branches; again, others injure the vine by either sucking the bark, the fruit, or the leaves; and finally, insects injure the fruit by actually boring into it.

These various classes of insects, therefore, require different treatment, as a remedy that will kill an insect that is feeding on the foliage would be of little value in the case of an insect burrowing into the fruit.

1st.—Insects destroying the foliage, bark, stems of bunches, &c., by actually devouring same.

This class of insects does considerable damage, and includes several kinds of caterpillars, crickets, grasshoppers, leaf and bark eating beetles; and there is one remedy for dealing with them—namely, to poison the food on which they are feeding. The best poison to use for this purpose is a preparation of arsenic such as Paris green, or a mixture of white arsenic or lime.

Paris green is a powerful arsenical poison, and a good sample should contain at least 50 per cent. of arsenious acid. It is generally used by itself, but if desired it can be used with lime, in the proportion of 1 lb. of Paris green to 4 lb. or more of lime. Mixing it with lime tends to make it less dangerous to handle, and will not interfere in any way with its action. The best way to mix Paris green with water is to place it in a cup or billy with a little cold water and thoroughly moisten every particle, the same way as mustard is mixed up for table use; then add more water gradually, stirring well whilst doing so, till it is thoroughly mixed; then add the requisite quantity of water. Paris green is used at a strength not exceeding 1 lb. to 160 gallons of water. It must always be kept well stirred whilst in use. It must not be sprayed on during rain, bright sunshine, or heavy drying winds. It should be handled with care, and kept out of the way of children. It should always be applied as a very fine spray, and persons spraying should take care not to inhale too much of the spray.

When purchasing Paris green see that you are supplied with a genuine article, such as Blundell's, as the use of inferior brands will result in disappointment and loss. First quality Paris green can be obtained from the wholesale chemists at 1s. 3d. per lb.

White arsenic and lime is prepared in the following manner:—Take

White arsenic	1 lb.
Unslacked lime	2 lb.
Water	3 gallons.

Slowly slack the lime, add the arsenic, put in the water, and boil for one hour. Add 160 gallons of water, and it is ready for use. In making this mixture be very careful to boil thoroughly, and if the lime is not of good quality increase the quantity.

Both of these mixtures can be used in conjunction with Bordeaux mixture, the combined spray being then the best remedy for both leaf-eating insects and fungus pests.

2nd.—Insects boring into the vine.

These are usually the larvæ of large horny weevils, commonly called elephant beetles on account of their long snout. The mature insects lay their eggs on the wood of the vine, often where a cut has been made in pruning, and the young larvæ on hatching out burrows into the vine. The mature insects often feed on the leaves or young bark, and spraying with arsenical poisons will destroy them. Painting the whole of the wood of the vine after pruning with a mixture of sulphur and lime will also tend to prevent the beetles from laying their eggs on the vine. When the borers are in the vine, the best remedy is to cut them out and destroy them.

In addition to tree-borers vines are often attacked by white ants. The ants are often attracted to the vines by the stakes used to support the vines, or by decaying roots left in the soil after clearing. When white ants are in the stakes they can easily be destroyed by means of arsenite of soda applied to the stakes. When present in the ground they may also be destroyed by placing pieces of soft pine, to which they are very partial, that have been soaked in a solution of arsenite of soda, in the soil. The ants will eat the poisoned pine and be destroyed. There is another way of destroying the ants when in the vine itself, and that is by breaking into their runway, placing therein a piece of rag, tow, or cotton wool, and pouring on same about half an ounce of bi-sulphide of carbon, and at once covering it up. The bi-sulphide evaporates rapidly, and the fumes spread through all the workings of the ants, destroying all the insects breathing them.

Arsenite of soda is easily made by boiling 1 lb. of white arsenic and 1 lb. of washing soda in an oil-drum holding about 4 gallons of water. This solution will be quite strong enough to kill any ants that eat it. If preferred, any of the liquid ant poisons that are on the market may be used instead of arsenite of soda.

3rd.—Insects sucking the bark, skin of fruit, or leaves.

As a rule, insects of this class do not do much harm to vines, but occasionally the red scale of orange-trees and a species of *Lecanium* or soft scale—the latter of which is accompanied by the black smut or fumagine—do a considerable amount of damage. The remedy in this case is the same as that in use in the case of fruit trees—namely, spraying with a wash that kills the insects by touching them. For this purpose the best wash is the resin wash, made as follows:—

Take 20 lb. of resin, 6 lb. of caustic soda (70 per cent.), 3 pints of whale oil, water to make 80 gallons; place the resin, caustic soda, and fish oil in a large boiler with 20 gallons of water, and boil for three hours; then add hot water slowly, and stir well till there are at least 40 gallons of hot solution; then add cold water to make up the total to 80 gallons. Never add cold water when cooking, or the resin will be precipitated, and it will be difficult to get it in solution.

4th.—Insects boring into the fruit.

Several insects injure the fruit by boring into it, of which probably the most injurious are the large sucking moths, which pierce the fruit and extract the juice. Catching the moths by hand at night, and attracting them by means of ripe cavendish bananas hung up in different parts of the vineyard, and on which they can easily be captured, are the best remedies.

Fruit fly also attacks grapes, and the best remedy against this pest is not to grow other fruits in or adjacent to the vineyard that are great breeders of

this pest, such as peaches, Japanese plums, &c. Fortunately the fruit-fly does not damage grapes to the same extent as it does many other fruits, and it is seldom that the larvæ comes to maturity in the fruit.

Although it will be seen from what I have written that many kinds of insects have to be fought by vine-growers, the damage done by them is insignificant when compared with that caused by fungus pests, of which two in particular are very destructive when neglected, or during periods when the climatic conditions are particularly favourable to their development.

OIDIUM, OIDIUM TUCKERI, ERYSIPHE TUCKERI.

This fungus disease of the vine is general throughout Australia, and is commonly known as Oïdium or Powdery Mildew. It is a purely external fungus, and does not penetrate the vine, but grows on the surface of the leaves, wood, and fruit—in fact, it attacks every green portion of the vine. The conditions favourable for its development are heat and moisture, close muggy weather being particularly favourable to it. It usually attacks the young leaves first, and spreads from them to the wood and bunches. It is a disease in which prevention is better than cure, as once it has become established it is extremely difficult to keep it in check. Sulphuring the vines is the preventive, but to be effectual the sulphur must be applied before the fungus makes its appearance. The sulphur used must be in the form of the finest possible powder, ground sulphur not sub-limed. The finer the particles of sulphur the better the result, and the less is required. Coarsely ground sulphur should not be used. There are many methods of applying the sulphur, but by far the best and most economical is by means of a knapsack sulphuring machine. Less sulphur is

FIG. 1.

used, it is better distributed, and it is not so liable to get into the eyes of the person sulphuring. As already stated, the sulphur should be applied before the disease makes its appearance, when the growth is quite small. Every part of the vine should be covered with a fine film of sulphur, and the operation should be repeated several times—the number of sulphurings depending on the season and rainfall.

I am not in favour of sulphuring when the dew is on the vines, as the moisture tends to concentrate the sulphur into lumps, whereas in order to get the best results it should be spread over the whole of the vine as finely and evenly as possible, as the better it is distributed the more fumes will be given off. Sulphuring on a warm day with a light wind is the best, and should rain follow the sulphuring it must be repeated.

ANTHRACNOSE OR BLACK SPOT.

This well-known disease is very prevalent in this State, especially in the case of white and many of the better varieties of table grapes. It has been described from time to time in this *Journal*, and its appearance is so well known that it is needless for me to describe it. Like oïdium and other fungus diseases, it is better to use preventive than remedial measures, and of these the winter treatment is by far and away the most effectual. After pruning, remove all the old bark and burn it, as this only forms a harbour for the spores of the fungus, and then when the buds are swelling, say some ten days before they will burst, apply one of the following mixtures:—

Sulphate of Iron Wash.

Sulphate of iron (copperas)	5 lb.
Sulphuric acid	½ pint
Warm water	1 gallon.

Pour the sulphuric acid over the copperas in a wooden bucket, then add the water.

Sulphuric Acid Wash.

Sulphuric acid	½ to ¾ of a pint
Water	1 gallon

Use a wooden bucket; add the acid to the water slowly and stir.

Both these mixtures are applied with a swab to every part of the vine. Take care not to splash the mixtures more than can be helped when using, as they will burn the hands, face, or clothes wherever they touch. This winter treatment is followed up by spraying with Bordeaux mixture, using a knapsack pump fitted with a Vermorel nozzle. The first spraying should be given when

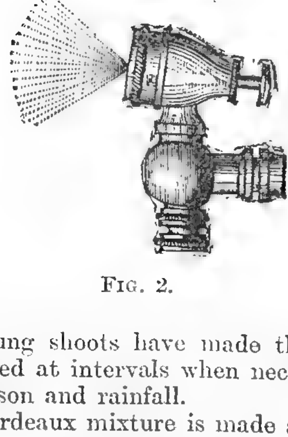


FIG. 2.

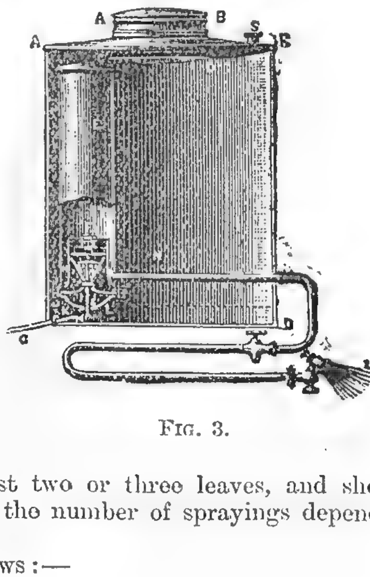


FIG. 3.

the young shoots have made their first two or three leaves, and should be continued at intervals when necessary, the number of sprayings depending on the season and rainfall.

Bordeaux mixture is made as follows:—

6 lb. bluestone
4 lb. unslacked lime
40 gallons water.

(1) Dissolve 6 lb. of bluestone in 20 gallons of water in one cask by placing it in a bag and suspending it in the water.
(2) Slack 4 lb. of unslacked lime in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream free from lumps. Water should now be added, stirring well till there are 20 gallons of milk of lime in the cask.
(3) Stir the milk of lime up well, strain it and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask; stir well for 3 minutes, and if properly made the mixture is fit for use.

The mixture is much better if made in this manner than when a strong solution of bluestone and lime is first mixed together, and water to make up the required quantity is afterwards added.

In order to see if the mixture is properly made, plunge the blade of a knife into it for a minute. If the knife is untarnished the mixture is all right; but if the knife is stained a coppery colour, then more milk of lime must be added.

The mixture should always be neutral, as if there is an excess of bluestone it is apt to injure the foliage. Use water that is free from iron, and do not make the mixture in iron, zinc, or tin vessels of any kind—wood is the best.

If desirable, a stock solution of bluestone may be kept on hand for use as required. Such a solution may be made by dissolving 100 lb. of bluestone in 50 gallons of water. Place the 100 lb. of bluestone in a bag and suspend it in the cask of water, and in the course of a couple of days the whole of the bluestone will be dissolved, and each gallon of the solution will contain 2 lb. of bluestone.

To make the 40-gallon solution you therefore take 3 gallons of the stock solution of bluestone and add 17 gallons of water to it, to make up the 20 gallons of bluestone solution for mixing with the 20 gallons of milk of lime as previously described. A stock solution of milk of lime can also be made, but it is better to make it as required.

When fresh lime is hard to procure, washing soda may be used in place of it, the proportion being 6 lb. of bluestone, 9 lb. of washing soda, to 50 gallons of water. It is a good remedy, but not quite equal to Bordeaux mixture.

When purchasing bluestone always see that you get the best; cheap bluestone adulterated with copperas will often do more harm than good.

Broussin.

This is a canker-like thickening of the stem of the vine near the surface of the ground, and sometimes on the branches of the vine. The remedy is to cut the growth away and dress the wound with the sulphate of iron wash recommended in the case of black spot. When vines are regularly treated for black spot it seldom makes its appearance.

Mouldy Root, or White Rot on Vine Roots.

This is due to the presence of the tissue growth of several kinds of fungi, which encircle the stem and roots of the vine, and finally kill it out. Mouldy root is seldom found on vines growing on warm, free, well-drained soils, but where vines are planted on low or badly drained soils it is fairly common. The remedy is drainage. When the vines are not badly attacked if a space is opened up round the trunk of the vine during winter, so as to expose the roots, and these are treated with a mixture of lime and sulphur, the disease is often checked; but when the vine or vines are badly attacked it is better to take them out and burn them, as the disease will spread to adjacent healthy vines. Take out all affected roots; lime the ground, and do not replant in grapes for some years. Drainage is the best remedy, and will in time stamp out the disease.

FAILURE OF BLOSSOMS TO SET.

This is a common trouble with certain varieties of grapes, such as White Muscat of Alexandria and Black Prince. It is not due to disease, but rather to the fact that the pollen of the plants is not freed, and consequently they are not fertilised. In hothouse culture it is a common practice to shake the bunches of bad-setting varieties when in blossom so as to free the pollen, and sulphuring the vines when in blossom has often the same effect.

In addition to the fungus diseases mentioned there are several others doing more or less damage. The nature of these fungi is not clearly understood, but is being investigated by the Government Pathologist, and the result of his investigations will be published in due course. The winter and summer treatment recommended in the case of black spot will, however, probably prove efficacious in the case of these other fungi, as the washes used are efficacious in the cure of nearly all fungus diseases. The illustrations herewith represent the two best machines for dealing with vine diseases. No. 1, the Figaro knapsack sprayer; No. 2, Vamorel nozzle for same; and No. 3, the knapsack sulphuring machine. The price in Brisbane of No. 1 is 45s.; of No. 2, 5s. 3d.; and of No. 3, 37s. 6d.

FRUIT-GROWING IN AMERICA.

When they grow fruit, tomatoes, or celery, or berries in America, they do it properly. In Queensland, a man with 20 acres of tomatoes or a couple of acres of celery would be likely to find his produce a drug on the market. The *Fruit and Produce News* says that in the tomato section on the east coast of Florida, Fort Lauderdale had 300 acres in 1903. This year there are 1,000 acres. On 15th March, six carloads of tomatoes were sent away, and it was expected that twenty cars per day would soon be going from that station alone. One man sold a crop from one acre for 1,200 dollars or £240.

The following advertisement appears in the *Miami Record*. It shows on what a large scale the tomato business is carried on on the east coast:—"Wanted, 250 tomato packers, 5 fast crate-makers."

The *Journal of Agriculture*, St. Louis, says that a South Florida orange and tomato grower brings his produce to shipping point in a 10-ton steam automobile. One orange-grower has shipped 6,000 boxes of oranges from New Smyrna, and has 1,000 boxes of grape-fruit (pomelos) to ship yet, and his grove is once more a mass of bloom. A population of nearly 90 millions affords a better living to farmers than one of 500,000 persons like Queensland.

The *St. Augustine Record* is authority for the statement that the estimated tomato crop on the East Coast "already shipped and to be shipped will aggregate 1,250,000 crates, with other vegetables in proportion." At an average charge of 16 cents per crate the East Coast Railway will take out of the county 200,000 dollars for transporting the above estimated crop to Jacksonville. At 8 cents per crate the railroad would receive 100,000 dollars, which would be good pay for the service performed, and the East Coast truckers would be 100,000 dollars better off. It would be wisdom on the part of all shippers to so combine and control conditions that they would always have a rate of not more than 8 cents per crate.—*Cocoa and Rockledge News.*

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order RUTACEÆ.

CITRUS, Linn.

C. Garrawayi, *Bail. sp. nov.* A small tree or tall shrub; branchlets very slender and slightly rough. Leaves from 1 to $1\frac{3}{4}$ in. long, $\frac{1}{2}$ to 1 in. broad, shape very irregular; petioles about 2 lines; veins very oblique and prominent. Axillary spines few on the specimens seen, and those not exceeding 1 line in length. Fruit upon the slender branchlets oblong, $2\frac{1}{2}$ in. long, 14 lines diameter. Oil glands large, giving a tuberculose appearance to the fruits; ultimately these glands sink, and the fruit appears then to be lacunose; rind very thin; cells 4 or 5; pulp of a sharp agreeable acid; seeds 3-angular, white, free, with more or less very short hairs, about 3 lines long and 2 lines thick in the centre. The rough rind of the fruit somewhat resembles that of *C. australis*, but the form of fruit is nearer to that of *C. australasica;* the fruit of this latter, however, is nearly smooth and the glands small.

Hab.: Summit of Mount White, Cape York Peninsula, altitude about 1,300 ft., *R. W. Garraway*, May, 1904.

Order LEGUMINOSÆ.

TRIBE HEDYSAREÆ.

ZORNIA, Gmel.

Z. diphylla, var. Stirlingi. This variety attains a height of from 1 to 2 ft. No leaves on specimens to hand. Inflorescence dichotomously branched, about 1 ft. long. Flower spikes from 3 to 6 in. long. Bracts broadly-lanceolate, about $\frac{1}{2}$-in. long, 3 to 4 lines broad, the portion below the insertion or auricle $1\frac{1}{2}$ line long, palmately 5 to 7, nerved and prominently glandularly dotted; margins with long white cilia. Calyx white with long cilia; corolla yellow; pod of 2 echinate articles; seed smooth, golden colour.

Hab.: Herberton, *J. Stirling.*

Order ARALIACEÆ.

PENTAPANAX, Seem.

P. bellenden-keriensis, *Bail. n. sp.* A glabrous, erect, slender-stemmed shrub attaining the height of 7 to 8 ft. Leaves crowded at the summit of the stem, erecto-patent, bipinnate, about 4 in. long, on finely-grooved petioles of about the same length, expanding at the base and shortly clasping the stem. Leaflets ovate-lanceolate, coriaceous, about $1\frac{1}{2}$ in. long, margins recurved, primary nerves distant and very oblique, and with the reticulate veins becoming prominent in the dried specimen; the petiolules of various lengths, usually exceeding $\frac{1}{2}$ in. Panicles terminal, erect, shorter than the leaves, branching from the base, the lower branches sometimes whorled, the ultimate slender branchlets tuberculose, bearing simple or more or less compound umbels of 6 or less sessile flowers. No flowering specimens obtained. Fruits nearly globular, smooth, and fleshy, 3 to 4 lines long, those examined 2 or 3-celled, but probably other fruits might

show more; calyx-border on fruit obscure except for the 5 minute teeth. Styles connate in a thick conical tuberculose mass, crowned by a rather prominent umbonate stigma.

Hab.: Summit of Bellenden-Ker, Meston's Expedition, 1904.

NOTE.—The formation of this name may call for an explanation or apology, for I find that botanists using the name of this North Queensland habitat as a specific name have not used it entire, but have been content with either the first or last part only; for instance, there is a Moss, *Fissidens Kerianus*, and a Lichen, *Porina bellendenica*, neither of which is given in honour of John Bellenden-Ker, but refer to the plants having been met with in the vicinity of the Bellenden-Ker Range. In naming this new Pentapanax, *P. bellenden-keriensis*, I am following those botanists who have formed such names as *novæ-guineæ*, *neo-caledonica*, *novæ-hollandiæ*, &c.—names which clearly point to the plants' habitats.

Order RUBIACEÆ.

PSYCHOTRIA, Linn.

P. cœlospermum, *Bail. sp. nov.* A tall glabrous climber with the habit and appearance of *Cœlospermum paniculatum*, F. v. M. Leaves coriaceous, ovate-oblong, about 4 in. long and 2 in. broad, base cuneate, apex bluntly acuminate, the midrib and lateral-nerves more or less prominent, latter looping within the margin and forming an intramarginal one, petioles about ½-in. long. Stipules very deciduous, acuminate, shorter than the petioles. Flowers sometimes forming broad-spreading panicles, at other times more or less crowded, the ultimate branchlets forming cymes of shortly pedicellate flowers. Bracts ovate-acuminate, usually short. No flowers seen. Fruit white of from 2 to 4 pyrenes. Seed deeply ruminate.

Hab.: Barron River, 1877, *Bailey*. Meston's Expedition to Bellenden-Ker, 1904. Flowers still unknown, thus genus doubtful.

Order COMPOSITÆ.

ACANTHOSPERMUM, Schrank.

(From *akanthos*, a spine, and *sperma*, a seed.

Heads heterogamous radiate, ray florets female, uniseriate, fertile; disk florets male. Involucre uniseriate, herbaceous. Receptacle paleaceous; outer bracts bearing uncinate prickles, including the achenia. Corolla of female floret ligulate, ligule small, apex toothed; corolla of male floret regular, with short tube, 5-toothed. Anthers truncate at the base. Style simple pubescent. Achenes oblong, cuneate, compressed, armed with hooked prickles. Diffuse annuals, with axillary heads of yellow flowers. Inhabiting tropical America.

A. hispidum, *DC. Prod. V.*, 522; "Star Burr." An erect dichotomous pilose branching annual, 2 to 3 ft. high. Leaves opposite sessile, membranous, 1 to 2 in. long, margins more or less inciso-crenate. Flower-heads solitary and subsessile in the axils of the leaves. Achenes 5 to 10, arranged in the form of a star, obverse pyramidal, about 2 or 3 lines long, covered with hooked spines, the two terminal ones straight and longer than the rest.

Hab.: A South American plant, which has become naturalised about Townsville, and likely to prove, like the Bathurst and Noogoora Burrs, a troublesome pest in Queensland. This plant will be readily recognised from its prickly burrs forming flat stars in most of the axils of the lower leaves.

Order GOODENOVIEÆ.

GOODENIA, Sm.

SERIES FOLIOSÆ.

G. Stirlingi (after James Stirling), *Bail. sp. nov.* An erect glabrous undershrub or shrub. Branches angular from the prominent bases of the leaves. Leaves 1 to 1½ in. long, 3 to 5 lines broad, erecto-patent, sessile, oblong-lanceolate somewhat coriaceous, serrated in the upper part, 3-nerved to the lowest teeth, finely reticulate. Peduncles axillary, shorter than the leaves, the upper ones usually bearing 1, the lower ones 3 flowers; of the first the

bracteoles are small, linear, and basal, when 3-flowered the peduncle is furnished with a pair of lanceolate bracts at the summit about 5 lines long, the bracteoles also of these flowers are somewhat larger than those of the solitary flowers. Flowers yellow, expanding to about 1 in. diameter. Calyx glabrous, tube and lobes of about equal length, about 3 lines each, the latter linear-lanceolate. Corolla yellow, more or less hairy outside, lobes deeply separated, the hollow protuberance not conspicuous. Dissepiment of the ovary reached nearly to the top, ovules in 2 rows in each cell. Capsule ½-in. long, bearing a very prominent thick rib from each lobe of the calyx. Seeds numerous, flattish, the margin thickened. This new species seems to approach nearest to the South Australian *G. albiflora*, Schlecht.

Hab: Herberton, *Dr. James Stirling.*

Order SAPOTACEÆ.

LUCUMA, Juss.

L. obpyriformis, *Bail. sp. nov.* Only fruits preserved. Fruit said to be purple when fresh. Pedicels about 7 lines long, dotted with small tufts of short hairs. Calyx closely expanding under the fruit; lobes ovate, about 3 lines long, imbricate, the margins and midrib tomentose. Fruit 2¼ in. long, 1½ in. diameter, obpyriform, epicarp of rather thin substance, seed solitary, large roundish-oval, the upper end often with a short point, putamen hard not glossy, brown, lateral hilum very broad and nearly as long as the seed.

Hab.: Meston's Bellenden-Ker Expedition, 1904.

Order LABIATÆ.

HEMIGENIA, R. Br.

H. Clotteniana (after F. E. Clotten, who furnished the funds for printing a general index to "The Queensland Flora"), *Bail. sp. nov.* Branches at first terete and clothed with silvery-white appressed hairs, more scanty on the older branches and thus showing the dark colour of the bark. Leaves opposite, simple, or on the branchlets often in threes, and from the scars at the base of the specimen to hand in whorls of 3; 6 to 9 lines long, scarcely exceeding 2 lines in width, more or less obtuse, gradually tapering to the base, almost or quite sessile, hairy like the branches, somewhat fleshy and glandular rugose, appearing apiculate from the infolding of the leaf and its dark-coloured apex. Flowers solitary in the axils on short pedicels. Bracts linear, 3 lines long. Calyx 2-lipped, lips entire; upper one deep purple, about 4 lines long, obpyriform, with about 10 parallel nerves, 6 of which are more prominent than the others; lower one orbicular, much more hairy than the upper, not coloured, about 2 lines diameter. Corolla slightly exceeding 6 lines long, dilated at the throat, pubescent, probably when fresh of a lilac-colour; upper lip broad, emarginate; lower lip with 3 broad lobes. Stamens much shorter than the upper lip, filaments hairy; all the anthers with the lower end of the connective long, linear, and more or less hairy. In fruit the calyx-lips are much enlarged; the upper one deeply coloured, and both prominently nerved. Nuts deep orange and prominently reticulate.

Hab.: Herberton, *James Stirton.*

Order PROTEACEÆ.

KERMADECIA, Brongn.

K. Bleasdalii, *Benth. and Hook. Gen. Pl.* I find no record of the fruit of this tree ever having been described; however, among the fruit specimens obtained by Mr. A. Meston on the Bellenden-Ker Ranges are eight fruits which must, on my opinion, belong to it, or a close ally, but no flowers or foliage were ibtained by the collectors.

DESCRIPTION.—Fruit indehiscent, oblong or more or less pointed and compressed in the upper part, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long, glabrous and brown when dry. Epicarp or external skin smooth; the sarcocarp composed of a layer of corky-fibrous matter; endocarp thin, crustaceous. Testa membranous, brown; fleshy cotyledons (kernel) almond-shaped, about 10 lines long, 5 lines broad, extremely bitter. The fruit closely resembles that of Brabeium of South Africa.

Hab.: Bellenden-Ker Expedition, 1904, *A. Meston.*

Order EUPHORBIACEÆ.

JATROPHA, Linn.

J. gossypifolia, *Linn. Sp. Pl.* 1006; "Cotton-leaved Physic-nut." A shrub of a few feet, glabrous or the inflorescence and leaves pubescent. Leaves 3 to 5-lobed or partite, 2 to 4 in. in diameter, lobes glandular-serrate; petioles 2 to 4 in. long, with branched glandular scales or hairs. Stipules capillary multifid glandular, bracts and entire sepals glandular-ciliate. Stamens 10 to 12 monadelphous, petals purple or red. Capsule ovoid 3-lobed. Seeds smaller but resembling those of the castor-oil plant.

Hab.: A Brazilian plant, now spreading in and about Townsville. The plant is likely to prove poisonous to stock, therefore it should be kept out of pasture lands. To distinguish it from the castor-oil plant, which it somewhat resembles, one has only to observe that its young growth and leaf-stalks bear numerous branched hairs or glands, which are not met with upon the castor-oil plant.

Order ORCHIDEÆ.

BULBOPHYLLUM, Thouars.

B. lageniforme (the pseudo-bulb shaped like a Florence flask), *Bail. sp. nov.* Rhizome creeping, rather slender, and nearly glabrous, corrugated when dry; pseudo-bulbs numerous, but not crowded, flask-shaped like the utricle of Carex, smooth, becoming corrugated when dry, 4 lines high. Leaves solitary, linear-lanceolate, $1\frac{3}{4}$ in. long, widest part about 3 lines; midrib sharp and prominent, with numerous parallel veins on either side; upper surface foveolar dotted. Peduncles filiform, about as long as the leaves, bearing a linear bract near the centre, and a similar but shorter one close under the flower. Flowers 1 or at times 2; open and somewhat bell-shaped. Pedicels about 3 lines long, slightly enlarging upwards, and prominently tuberculose in the upper part. Sepals 4 lines long, 3-nerved, dorsal one lanceolate, lateral ones much broader at the base, the apex recurved. Petals ovate-lanceolate, shorter than the sepals, transparent, 3-nerved, the lateral ones not reaching the apex of the petal. Labellum coriaceous articulate at the base of the column, shorter than the other segments, ovate—the margins recurved, the disk with three prominent ribs. Column rather slender, in height a little over one-third of the petals; wings prominent truncate or toothed at the top, anther-lid depressed.

Hab.: On logs and rocks amongst moss. Summit of Bellenden-Ker, Bellenden-Ker Expedition, 1889, without flowers. One plant bearing two flowers, Bellenden-Ker Expedition, 1904. The latter specimen having been preserved in formalin, all colouring of the flowers was lost.

PTEROSTYLIS, R. Br.

P. Baptistii, *Fitzg. Aust. Orch. Ill., Vol. I., Pt. I., Plate* 2. Leaves elliptical to lanceolate, 2 to 4 in. long, on rather long petioles almost rosulate. Scape 1-flowered, often exceeding 1 ft. in height; sheathing bracts rather large. Galea inflated at the base on either side of the midrib, erect, but curved from about the centre, acuminate, about $2\frac{1}{2}$ in. long from point to the base of ovary. Lower lip cuneate with 2 broadly cupular lobes extending into lanceolate, and then subulate points embracing the galea, and longer than it. Labellum linear, compressed for about $\frac{1}{5}$ its length into a point, curved forward from where the compression commences, with a raised ridge along the centre on the front, and corresponding depression at the back. Basal appendage not very broadly

penicillate, in 2 tiers. Stigma cupular at the base, passing upwards into a long point between the wings of the column. Lower extension of wings long, falcate. Pollen masses hooked.

Hab.: Swamps, Old Cleveland road, *Bailey and H. G. Cheeseman.*

Order GRAMINEÆ.

POA, Linn.

P. arachnifera. (Dr. John Torrey gave to it the name *arachnifera*, from the cobwebby hairs which sometimes are found upon the flowers.) *Torr.* in Marcy, Exp. Red Riv. Louis, Bot. 301. "Texas Blue Grass." The running underground stems numerous, from these arise many stems with an abundance of radical leaves, stems 1½ to 3 feet high bearing from 2 to 4 leaves on long sheaths. Ligula rounded, or lacerated when old. Panicle 3 to 8 in. long, branches erect of unequal length, in clusters from 3 to more, the longest about 2 in. Spikelets containing about 5 flowers. Outer glumes ovate-lanceolate, margins scarious, keel scabrous. Flowering glumes longer, gradually sharp pointed, smooth except the margins and midrib, which are usually pubescent. Sometimes there is a remarkable development of long, silky hairs at the base of each flower, but at times this is quite absent.

Hab.: North America. Introduced and seed distributed by Queensland Agricultural Department in 1892. This grass has become naturalised on the Darling Downs, and is a valuable addition to our fodder grasses. It is to be hoped that this grass will continue to thrive in Queensland, and prove here what it is said to be in America—one of the best of winter grasses.

Horticulture.

NATURALLY-GROWN CHRYSANTHEMUMS.

A writer in the *Australian Gardener* deprecates the practice of growing chrysanthemums of the exhibition type, the sole object of which is to obtain flowers of the largest size. A naturally-grown plant—*i.e.*, one which has none of its shoots stopped, nor any of its buds removed—is far more beautiful and effective than the stiff, unweildy specimen plants at exhibitions.

In the cultivation of that class with which the present observations deal, the aim is entirely different; it is, in a word, the beauty and effectiveness of the plants as a whole rather than those of the individual flower. In growing this class of plants it is of great importance that each should be clothed with foliage almost or quite to the base of its stems, and that the shoots should be disposed and supported so as to secure sufficient symmetry of form.

With regard to the flowers themselves, the aim should be to obtain them large enough to show the true and distinctive character of the variety, and yet in sufficient number to fully furnish the plant, thus avoiding the wasteful process which accrues from restricting the energies of the plant to the production of two or three flowers.

It is questionable whether, by encouraging so exclusively as exhibitions do the big flower and the conventional specimen plant, the true interests of horticulture are furthered as much as would be done by adopting a system of culture that requires as much real gardening skill to obtain the best results, and which, from an artistic standpoint at least, are infinitely more pleasing. The groups of plants seen at even our best shows, with their carefully sloped surfaces, look brilliant and gorgeous enough at the top; but to the inquisitive eye that searches below there is revealed a huddled mass of long stalks and pots (the latter not unfrequently stood one above another), which is to the last degree unsightly. Looked at singly, such plants are hideous, and even when massed together in a formal sloping bank, which is the only arrangement they are presentable in, the few square yards of colour they give cannot be said to be an adequate return for all the expense and labour they have entailed during the previous twelve months.

Tropical Industries.

IMPROVING THE TOBACCO PLANT.

By R. S. NEVILL.

A series of interesting experiments has been carried out by Dr. Trobut, of Algeria, that prove tobacco may be improved by proper cultivation and selection, and are given in the *Western Tobacco Journal*, and herewith reproduced. It is a most valuable contribution to the tobacco industry, and should be carefully read and studied by every grower in Queensland.

These experiments have been made on common-sense lines, and are such as can be duplicated by the ordinary farmer. I would especially call the attention of intending growers to the manner in which he selects his seed and his seed plants, and if they are carefully followed will result in stronger and healthier plants, superior quality, and prevent the rapid deterioration of the plant, so common in Australia.

The *Western Tobacco Journal* says:—

The recent experiments conducted by Dr. Trobut, upon the selection and improvement of tobacco by means of seed selections, furnish valuable evidence for the guidance of growers of tobacco in all tobacco sections. He says that planters may rapidly ameliorate the race of tobacco they cultivate by using carefully selected seed. This choice, however, involves some precautions. The plants should be selected with the greatest care for seed purposes, and at the time of flowering covered around the inflorescence with light closely-woven cloth. By this operation one avoids the pollination of selected plants by pollen of inferior plants. It is also of advantage to carry on artificial pollination of the flowers on the selected stalks by carrying pollen from one to another. This operation is, to be sure, limited and somewhat uncertain, but it permits one, nevertheless, to obtain very vigorous plants of decided merit in many instances.

The experiments carried on by Dr. Trobut at the botanical station in Algeria during four years, on the value of tobacco crosses are an illustration of the usefulness of the practice. The object of those experiments was to unite all of the races of tobacco already acclimated in Algeria and a collection of exotic tobaccos. From the crosses of the introduced tobaccos with the best races already acclimated, there have resulted a certain number of varieties which seem advantageous for these regions. In the crosses carried on for the purpose of improving the native tobaccos, he observed that the seeds of tobacco are often badly formed and show low specific gravity. By placing the tobacco seed in water, it was observed that only one-half of the seed sunk to the bottom of the vessel. The seeds which floated on the surface of the water were nevertheless able to germinate, but gave less vigorous plants during their whole development.

By sowing the seed which floated and those which sank, he established the fact that all of the plants grown from the heavy seed were greener, taller, and more vigorous than the plants raised from the light seed. The seedlings transplanted in the same field, alternating a plant from heavy seed with a plant from light seed, preserved their characters, the plants from the heavy seed having the more desirable leaves and producing the best plants. The plants from the light seed developed more slowly, and had a tendency to bloom before having reached sufficient development. The weight of leaves from the plants grown from the light seed was hardly one-half that of the leaves harvested from the plants grown from the heavy seed.

There is no doubt that considerable advantage is to be derived from this easy selection of the heavy seed. Growers of tobacco always have an excessive amount of seed. Before sprouting or sowing this seed, they should throw it into a vessel of water, shake gently, and take out the seed that float, destroying it so that it can not be used for planting through any possible mistake. The amount of seed that float usually represents about one-half of the seed gathered. The heavy seed may be dried and preserved, or the best plan is to make the separation just before time for sowing, and then sow immediately after this treatment. The heavy seed thus planted will give more vigorous plants, producing better leaves, but with a tendency to bloom a little later than plants grown from the light seed.

In practice it may be found that few if any of the seeds sink immediately after having been thrown into the water. It seems that it is necessary for the seeds to stand for some time in the water, during which they become thoroughly moistened and will then sink. By careful examination, the moment when all of the heavy seed have sunk can be determined, and the light seed removed. Another plan for the separation of the light from the heavy seed is by the use of sieves having such sized openings that the heavy seed will fall through and the light seed be retained and finally discarded. Cheese cloth having the proper size of mesh can be used successfully for this purpose. If it is possible to use an air blast, there is probably no better method of separation. As the tobacco seeds are very light it will be found necessary to have a very steady current of air, and of such volume that the heavy seed will fall and the light seed be carried away. There are certain makes of the ordinary fanning mills which it is possible to adapt to tobacco seed, and will make the desired separation successful.

Experiments with Cultivation of Tobacco.

The first attempts of cultivation of tobacco in Algeria by the Europeans were made with seed of Paraguay and Palatinate, but these races have undergone successive transformation without having the qualities which were formerly preserved by the Arabs, but have nevertheless a greater production. This constant variation is such that under the name of colonial tobacco one meets many different types. Because of the impossibility of making constant individual selections and avoiding natural variations of the plant, it is a question whether the variety of tobacco alone has influence on the quality of the plant. In principle the best tobaccos are those which burn best, but the nature of the soil, methods of cultivation, practice of irrigation, and methods of curing and handling seem to affect the combustibility even more than the variety of the plant. The remarkable combustibility of the station tobacco is due to different causes; to selection of late varieties; although this is almost a heresy in the cultivation of tobacco. I do not hesitate to affirm that in the same soil and under the same conditions of cultivation certain races show themselves more combustible than others. That is to say, that those races preserve this advantage even when they are placed in poor soils, such as slightly alkaline soils. Suitable drainage, permitting the rain water to most easily wash away the chlorides of the arable layers of the soil, favours combustibility; under the opposite conditions the upper currents of water stand and evaporate, thus leaving in the surface soils harmful salts. A large amount of humus in the soil is an important condition for good combustibility. A preliminary experiment has shown in part that the carbonate of potash is superior to the sulphate or nitrate. In this experiment, comparing the carbonate with the sulphate and nitrate of potash and sulphate of ammonia, only the parts receiving pure carbonate of potash gave leaves that were nicely combustible.

Irrigation increases the number of leaves, but if carried to excess injures the quality of the tobacco.

A good illustration of this fact is the case of the tobacco grown on the plains of the Mitidja, the greatest centre of tobacco cultivation in Algeria,

where they have two kinds of tobacco, that of the eastern and that of the western Mitidja. In the latter region, where irrigation is not practised, the better qualities of tobacco are found, while the tobaccos of the western region, where irrigation is employed, are of less value.

Particular emphasis is laid upon the fact that, although the soil and cultivation play an important part in determining the quality of the tobacco, the manner of harvest, curing, and fermentation are very important. As is a well known fact, the methods of gathering and handling the crop affect, most decidedly, the colour of the leaves, there is little doubt but that there is almost an equally important influence upon the quality, particularly the combustibility and the aroma of the leaves.

The effect of green manure was very marked, the quantity and quality of tobacco being greatly augmented by its use. The two plants used for green manure in these experiments were the horse-bean and fennel grass. The fennel grass was sown very early, and obtained considerable size before it was ploughed under. When the tobacco stalks are cut down after harvest they are immediately ploughed under and buried to a good depth. As soon as possible the fennel grass and horse-bean are sown. These plants develop rapidly, and after three months of growth produced about 45 tons of green manure per hectare.

SELECTION OF YOUNG PLANTS IN THE SEED BED.

One of the important results of the work of Dr. Trobut has been his study of the effect of selection of young plants in the seed bed upon their yield and quality of the mature plants. He found that by an examination of the young plants in the seed bed it was possible to tell from the variation among the young plants the individuals which were most desirable for use and should be reserved for planting. He selected those young plants in which the side veins are at regular right angles to the midribs of the leaves. The plants having irregular veins, or other undesirable characteristics of leaves, were discarded, as he found that such plants did not develop good plants in the field. He concludes that it is perfectly practicable for the grower to study the young plants in the seed bed, and from this examination weed out the unprofitable types of plants. This point can well be taken into consideration by every grower, and by following these injunctions secure the best plants for growing in the field.

The greatest value of these experiments is the emphasis laid upon the value of good seed. There is no more important factor in the production of the crop, and up to this time little attention has been paid to its real importance. A good crop cannot be produced from poor seed, no matter how much labour and expense is given to the growing of the crop. On the other hand, careful seed selection and the securing of improved types and races of tobacco by hybridisation mean increased profits with little or no extra expenditure on the part of the grower. In view of the large acreage which a small amount of seed will plant, it seems that there is no crop in which practical results can be obtained so sure and with such widespread beneficial results as in the case of tobacco. Heretofore, growers have allowed the matter to work out for itself, making no direct effort to produce desired types, races, or uniformity of quantity and quality of tobacco, but the time has come, as in the case of other crops, when it is possible to decide upon the type desired, and by following the laws of selection and crossing produce the desired kind of tobacco.

THE FIBRE INDUSTRY OF MAURITIUS.

SISAL v. FOURCROYA.

We take the following interesting account of the Aloe fibre industry at Mauritius from a *résumé* of the annual report of Mr. P. Boname, Director of the Agronomic Station at Mauritius, published in the *Journal d'Agriculture Tropicale* last March.

In that island the *Fourcroya gigantea* is exclusively employed for the production of fibre, and on this point the editor remarks:—"The fact of the economic superiority of the Sisal *(Agave rigida, var. sisalana)* over the Fourcroya, which may be considered to have been clearly proved by Mr. Boname, is borne out by all that has been published up to the present about the vast plantations, as yet young, in German East Africa. The Germans have already lost much money by ignoring this superiority when forming their plantations, and they will lose still more."*

The textile fibre industry has assumed fresh importance at Mauritius, owing to the increase in price of these products during the last few years.

There, the *Fourcroya gigantea*, vulgarly called "green aloe"—to distinguish it from the *Agave americana*, or blue aloe, of which there are a few isolated plants in the Fourcroya lands—is exclusively worked. As a matter of fact, the Fourcroya is not *cultivated*, it is simply harvested—that is to say, new plantations are rarely formed: the planters content themselves with gathering the leaves of existing plants, which have rapidly increased on the dry barren shores where want of water will not admit of any other crop being raised.

When the Fourcroya flowers, its flower-pole supplies a large number of bulbils which ensure a natural reproduction. These bulbils fall on to a soil more or less cumbered with an herbaceous or shrubby vegetation, and easily take root. In the early days of rooting, they form a thick nursery of young plants, but gradually the greater number die off and disappear, and only the strongest or those growing under the most favourable conditions survive. Barely sufficient live to ensure a prolific propagation of the species.

The lands on which the Fourcroya has increased are generally covered with a vegetation consisting principally of "Old Maids" *(Lantana camara)* and of Acacias *(Leucæna glauca)*. These three dispute the empire of the soil, so that it is impossible to arrive at an estimate of the return which might result from a plantation properly formed, with the plants placed at regular distances so as not to be destructive of each other.

One of the advantages of the fibre industry is that the crop may be gathered whenever the farmer pleases, either when market prices are at their best, or when local circumstances such as supply of labour or other matters are most favourable. In fact, the harvest can wait without any danger of deterioration. Thus, many sugar-planters who have large areas of land uncultivated and covered with Fourcroya manufacture the fibre during the slack time, when labour is abundant and cheap. If the price for the fibre falls, or if labour is scarce, the manufacture of fibre is stopped, to be taken up again with renewed activity when conditions are more favourable.

The export of Fourcroya fibre from Mauritius has varied during the last twenty years from 358 to 3,000 tons annually, the value being from 90,000 to 1,000,000 rupees,† or from £6,000 to £66,666.

The average price paid locally during the same period has varied from an annual average of from 207 to 420 rupees (£13 16s. to £28) per ton. It will be seen by these differences in output and value how advantageous it is to be able to push on manufacture at certain times, seeing that the price given at first scarcely varies at such seasons.

When the factories are in want of leaves they buy them wherever they can find any for sale. The cost of leaves sufficient to make 1 ton of fibre averages about 10 rupees (13s. 4d.) Thus the purchasing price is a mere trifle

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* The fibre of the Fourcroya is valuable, but not in any way so valuable as that of the sisal. Queenslanders who propose to enter upon the cultivation of sisal hemp should note this, as there are a large number of Fourcroya plants growing wild in different parts of the State, which already one or two farmers are proposing to plant. Why should they do so when they can get the true sisal from the Department of Agriculture for nothing?—Ed. *Q.A.J.*

† 1 Rupee = 1s. 4d.

out of the return for the fibre; but the cost of cutting the leaves is another matter, which is always at the expense of the buyer. Carriage may also prove rather expensive, for it takes about 40 tons of leaves to make 1 ton of fibre; it is easy, therefore, to understand that transport becomes pretty onerous if the leaves have to be brought a long distance. It is these expenses which are subject to the greatest variation, reaching, according to conditions, from 25 to 50 rupees per ton of fibre (33s. 4d. to £3 16s. 8d.).

If water-power is used to drive the scutching machines, work is conducted very reasonably, but, if steam has to be employed, the cost of fuel does not admit of good profits unless prices are high.

Inasmuch as many plantations make only expenses when fibre is sold at 200 rupees (£13 6s.), they make splendid profits when the price reaches 400 rupees (£26 12s.), as we have seen only a few months ago.

The only machine used at Mauritius for preparing the fibre is the "Gratte," which is very similar to the Mexican "Raspador."

The Gratte is a primitive but very strong machine, and its use on all small plantations is explained by its simplicity and its cheapness—250 rupees (£16 13s.), without motive power. At Mauritius the machine-house usually has 2 Grattes, at most, 5 or 6 installed, and these even work very intermittently. The Gratte is a locally made (Mauritius) machine, requiring for motive power 2 to 2½ horsepower oil engine. The drum revolves at 800 revolutions a minute. It will turn out from 125 (275 lb.) to 150 (330 lb.) kilogrammes of dry fibre in a day of 10 hours—that is to say, it will clean from 5,000 to 6,000 kilogrammes (11,000 to 13,200 lb.) of green leaves in that time; two men are sufficient to work it, but, as they work usually only for about 5 hours, two shifts are employed. The workmen place themselves on each side of the Gratte, wearing leather gloves to protect their hands from the burning action of the juice from the leaves. The base or thick end of the leaf is first put under the drum, the other end is held firmly in the hand; the leaf being thus half-cleaned; the workman draws it out, seizes the cleaned fibres, and inserts the other end of it.

When the leaves are large, only one at a time is cleaned, but if they are small two or three are put in at once. The men are paid by piecework, receiving about 80 rupee-cents (12¾d.) per kilogramme (220 lb.) of green leaves.

It cannot be stated exactly how much fibre is yielded per leaf, as some are more mature than others; but it is calculated that on an average 40,000 kilogrammes (88,000 lb.) are required to produce 2,240 lb. or 1 ton of dry fibre.

We have seen that the purchase money of this quantity of leaves amounts to from 10 to 12 rupees (13s. 4d. to 16s.); cutting costs from 25 to 30 rupees (33s. 4d. to £2); cleaning, about the same. So that it may be reckoned that a ton of fibre costs 100 rupees (£6 13s.) on leaving the Gratte.

If the price of fibre is 200 rupees (£13 6s.) per ton, there will be a balance of 100 rupees (£6 13s.) to pay the cost of motive power, washing, drying, baling, and all other expenses up to delivery of the fibre to the buyer. The carriage of leaves to the machine is always a heavy expense (in Mauritius) simply because there are no cultivated plantations, and that planters content themselves with working lands (self-planted) more or less distant from the factory, where the Fourcroya and a spontaneous vegetation dispute the ground with each other. The above expenses might be reduced by preparing the fibre on the spot by using a Gratte driven by a small motor, the whole mounted on a carriage which could be moved at will. The only carriage expense incurred would be that of the raw fibre—that is to say, of one-tenth of the weight of the green leaves.

It has been stated here that only the Fourcroya is worked at Mauritius, but, considering the actual price of the fibre, it might be advantageous to

establish new plantations under normal conditions, and, in this case, would it be advisable to stick to the Fourcroya or to plant in preference the true sisal or henequen, the *Agave rigida*, var. *sisalana?*

This last variety, which is cultivated in almost all fibre-producing countries, was introduced into Mauritius some years ago, but as even at that time no new plantations of Fourcroya were being made the sisal plant did not increase. Still, the sisal has great advantages over the Fourcroya, which it much resembles as far as habit of growth and development are concerned. The sisal fibre is much easier to prepare and clean, and the price is always much higher in foreign markets; besides, the yield of fibre is far greater. As far as the yield is concerned, the following two experiments are conclusive. The Fourcroya leaves came from two different localities—from the Réduit, 1,050 feet above sea-level, and from the Pailles, a hot, dry locality on the seaboard. All the leaves were cleaned on the same Gratte and by the same workman. There are two varieties of Fourcroya. One is called the *Aloès malgache,* whose leaves are thicker and more fleshy, especially at the base. The other is the *Aloès créole,* by far the widest spread. As will be seen by the table below, the second variety appears to be preferable to the first:—

YIELD OF FIBRE FROM LEAVES OF ALOES MALGACHE, ALOES CREOLE, AND SISAL.

—	FIRST TRIAL.			SECOND TRIAL.			
	Sisal from the Réduit.	Aloès Malgache from the Réduit.	Aloès Créole. Pailles.	Sisal from the Réduit.	Aloès Malgache. Réduit.	Aloès Créole. Réduit.	Aloès Créole. Pailles.
Number of leaves	30	30	...	30	30	30	10
Weight of leaves, kilogs	36	65	47	37·5	57·5	27·5	13·7
Weight of wet fibre, kilo	5·100	4·950	4·900	4·400	4·700	2·870	1·650
Weight of dry fibre, kilogs ...	1·510	0·930	1·170	1·580	0·955	0·602	0·365
Dry fibre, per 100 wet fibre ...	29·6	18.8	23·9	35·8	20 3	21·0	22·1
Wet fibre, per 100 leaves	14·16	7·61	10·42	11·8	8·2	10·4	12·00
Dry fibre, per 100 leaves	4·19	1·43	2·49	4·21	1·66	2·19	2·65

The result of these experiments shows that the Aloe called malagache is of inferior quality, and that the plants from the seaboard yield a larger quantity of fibre; but the most characteristic feature is the superiority of the *Agave rigida* (the true sisal) over the Fourcroya. Admitting that the Fourcroya gives a return of 2½ per cent., which is not always obtained, and that the *Agave rigida* yields 4 per cent. under similar conditions, we have an increase of 60 per cent. on the quantity of fibre obtained from a similar weight of leaves, without taking into account the economy in carriage of the leaves and the advantage of greater facility in extracting the fibre. . . . . .

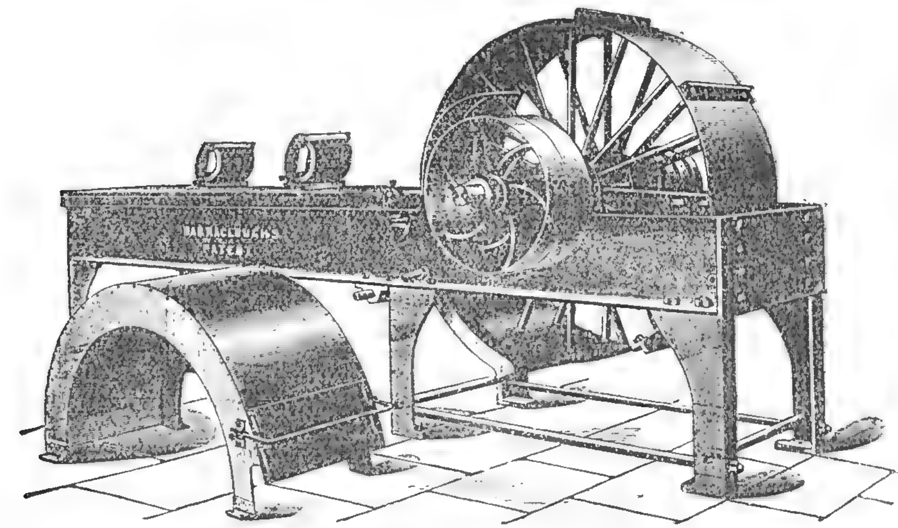
After extraction of the fibre of the Fourcroya in the Mauritius factories, there remains a mass of detritus almost equal to the weight of the leaves manipulated; these semi-liquid débris accumulate in the neighbourhood of the factories, where they gradually decompose and form a manure, the value of which we have before pointed out*, containing the principal fertilisers of the pulp and sap. Of this latter there is only a small quantity in the mass of débris, the surplus running off into the neighbouring streams. Admitting that 1 ton of leaves produces 700 kilogrammes (1,570 lb.) of juice and 300 kilogrammes (660 lb.) of half-dry pulp (which is a fairly correct allowance), we

* We have omitted the analysis here referred to. The manurial value is set down at 65 rupees (£4 6s.) per ton of fibre exported. Taking the ordinary price paid for the leaves required to produce 1 ton of fibre, we get 13·30 rupees (about 17s.); consequently the aloe leaves are sold at one-fifth of the value they would represent as manure.—Ed. *Q.A.J.*

obtain the following results by analysis of the solid residue or refuse and of the liquid collected at the factory:—

—	Composition per 1,000 kg.		Residue of One Ton of Leaves.		
	Juice.	Pulp.	Juice 700 kg.	Pulp 300 kg.	Leaves 1,000 kg.
Chlorine	0·07	0·30	0·949	0·090	0·139
Sulphuric acid	0·13	0·21	0·091	0·063	0·154
Phosphoric acid	0·43	0·41	0·301	0·123	0·424
Lime	0·87	4·78	0·609	1·434	2·043
Magnesia	1·19	1·74	0·833	6·522	1·355
Potash	3·09	3·02	2·163	0·906	3 069
Total mineral matter	7·80	17·20	5·460	5·160	10·620
Azote	0·50	1·97	0·350	0 591	0.941

The large content of potash will be noted, which is principally in the juice, which is partly lost, as we have said. With regard to the unpleasantness of the aloe manure, it may be observed that the decomposition is relatively very slow.



THE BARRACLOUGH SISAL HEMP CLEANING MACHINE.

We shall describe this and other machines in the next issue of the *Journal*.

VANILLA.

The northern climate of Queensland in the scrub-clad coastal districts is very suitable for the growth of vanilla. Wherever it has been experimentally tried there, it has done well, and, with attention to instructions, to be obtained from the manager of the State Nursery at Kamerunga, Cairns, it should be easy to establish vanilla-growing as a permanent industry. As will be seen by the following article, which we take from the *Journal of the Agricultural Society of Jamaica*, the conditions prevailing in the tropical North of this State are such as would be eminently conducive to success:—

The vanilla of commerce *(V. planifolia)* grows wild to a small extent in the northern parts of St. Elizabeth, which have a good rainfall. It may be seen climbing over other plants in gardens and provision grounds, untended

and neglected. In other parts of the world vanilla is carefully cultivated, as in the Seychelles Islands, and new plantations are being started, especially in Mexico. There is room for and need for a good vanilla industry in Jamaica, and, where conditions are suitable, it should be taken up with system. It grows best under light shade, and so can be planted through places where trees are standing, and on these trees it will climb.

Vanilla cuttings, from 2 to 10 feet long, or plants should be set out, one or two at the foot of each tree. Standards might also be placed between the trees, so as to set out the vanilla plants about 2 feet apart. The soil should be well dug and broken up 10 or 16 inches deep; rich leaf mould, or soil such as is found by the trunks of Guango trees, planted in the hole; the plant set out upright, 3 or 4 inches deep; and the soil pressed round and raised or moulded a little above the level of the surrounded ground. Unless the season is wet, water should be applied for a few days after planting. The field should be kept clean and free from weeds and bush, and as the plants grow they should be trained up the trunk and along the branches of the physic nut-trees by tying the vine with bits of cloth or plantain bark.

Fertilising the Flowers.—The vanilla being found fruiting in the wild state here, artificial fecundation may not in all cases be found to be necessary. The natural fertilising agents, such as bees, being present in good numbers, it would doubtless act on any vanilla under cultivation. But should it become necessary to assist nature artificially, the operation is generally done in the following manner:—Hold the base of the flower between the thumb and second finger of left hand horizontally, then with the point of a sharpened stick about the size of a thin pencil displace the pollen and attach it to the stigma or viscid surface in the same flower; withdraw the instrument, and the flower is fertilised. Almost immediately after this the flower begins to wither, and about the end of the third day after fertilisation it is possible to detect whether the bean is assured or not. The way to perform the operation on these orchid flowers is easily learnt from one or two ocular demonstrations.

Harvesting.—Six or nine months from the time of fecundation the fruit begins to ripen. Beans that ripen first are generally somewhat inferior. Afterwards come the more matured beans, which should be kept separate. Pods should never be gathered before they get to the right stage of ripeness, as they are liable to be affected in their appearance and value. It is also important to avoid gathering the fruit too ripe; if this happens, the beans are sure to split at the lower end. To prevent this occurring, frequent visits must be made through the vanillery when vanilla is ready or about ready to be gathered. As each bean shows the right stage for plucking, remove it at once. The indication of ripening is a slight yellowing of the whole pod, which is more marked near its free end.

Curing the Beans.—To a certain extent, each vanilla-growing country has its own way of curing. There is the Guiana process, Peruvian, Réunion, Mexican, &c. The following is the Mexican process, and a good one:—As soon as gathered the beans are heaped under a shed protecting them from the sun and rain, and in a few days, when they begin to shrivel, are submitted to the "sweating" process; this is carried on in two different ways, according to the state of the weather. If it happens to be warm and fine, the beans are spread out in the early morning on a woollen blanket, and exposed to the direct rays of the sun. At about midday, or 1 o'clock in the afternoon, the blanket is folded around them, and the bundle is left in the sun for the remainder of the day. In the evening all the vanilla is closed in air-tight boxes, so that it may sweat the whole night. The next day the beans are again exposed to the direct action of the sun; they then acquire a dark coffee-colour, the shade being a deeper brown in proportion to the success of the sweating operation. Should the weather be cloudy, the vanilla is made into bundles, and a number of these are packed together in a small bale, which is first wrapped in a woollen cloth, then in a coating of banana leaves, and finally the whole is enclosed in a thick matting and sprinkled with water. The bales containing

the largest beans are now placed in an oven heated to 60 degrees C. (140 degrees Fahr.). When the temperature has fallen 45 degrees C. (130 degrees Fahr.), the smaller beans are introduced, and the oven closed tightly. Twenty-four hours afterwards the smaller beans are taken out, and twelve hours later the larger ones. During this process the vanilla has sweated and acquired a fine chestnut-brown colour. The delicate operation of drying the beans has now to be commenced; the beans are spread out on matting and exposed every day to the sun during nearly two months; when the drying is nearly complete sun-heat is no longer needed, and the beans are spread out in a dry place until the necessary degree of desiccation is arrived at. Finally they are sorted and then tied in small bundles for the market.

Commercial Value.—The vanilla bean varies considerably in price. The vanilla from the Seychelles Islands offered for sale realised, for pods of 8 to 8½ inches long and of good chocolate colour, 22s. 6d. per lb.; 7½ to 8 inches, 19s. 6d. to 21s. 6d. per lb., while the lowest grade of dry brown pods realised only from 4s. to 11s. 6d. per lb. It would seem that long well-cured pods are required in the market, and for this purpose strong and healthy plants should be grown, and the bearing should be regulated so as not to exhaust the strength of the vines.

THE PROSPECTS OF CASSAVA STARCH.

Some day, probably, Queensland farmers, when they have deviated from the old groove tending invariably towards potatoes, maize, and lucerne, will be induced to try a few paying subsidiary crops, such as cotton, sisal hemp, cassava, &c. Cassava starch is an article which would pay better than arrowroot if properly gone into. Mr. H. H. Cousins, M.A., F.C.S., Island Chemist, Jamaica, writes as follows to the journal of the Department of Agriculture, Jamaica, on this subject:—

Through the enterprise of Mr. J. W. Middleton, in testing the commercial production of starch at Longville, and his public spirit in placing his results at the disposal of the Board of Agriculture, it is now possible to form some definite opinion as to the possibilities of cassava starch as an industry for Jamaica.

The experiment at Longville has been of a tentative character, and the actual possibilities of the industry, when established on a reasonable commercial scale and with the best machinery and management, are far in excess of those directly indicated by Mr. Middleton's preliminary results.

AGRICULTURAL YIELD.

The returns of tubers per acre at Longville, as recorded by Mr. W. J. Thompson, varied considerably. Where the cassava had been planted between bananas or under shade, the yield was not satisfactory. Eight tons of tubers per acre were obtained on one piece of land, and there is every reason to believe that by thorough tillage and the propagation of the best varieties of cassava a return of 10 tons per acre can be reasonably expected. Mr. Joseph Shore finds that this is a fair return from lands in cassava on the northside.

The cost of production at Longville was 10s. 6d. per ton, with an 8-ton crop, allowing £1 per acre for rent. I estimate that the cost of production can be reduced to 8s. per ton by reasonable economies and improvements in the cultivation.

The Florida factories pay 18s. per ton for the tubers in the field, the cost of digging and delivery to the factory being about 6s. a ton in addition.

COST OF MANUFACTURE.

At Longville 6 tons of cassava tubers pulped in a small St. Vincent rotary grater yielded 1 ton of air-dried starch by the West Indian process. The cassava contained about 29 per cent. of starch. The actual cost of production of the starch, including the growing of the cassava, amounted to £8 per ton.

BY-PRODUCTS.

The bitty or residual pulp, when dried to a content of 15 per cent. of moisture, amounted to a return of $1\frac{1}{3}$ tons of dry material to each ton of starch. The composition of this product closely corresponded to that of the meal from the whole tubers sun-dried. Cassava bitty is, therefore, a valuable food-stuff for cattle or pigs. If we deduct 30s. per ton for the cost of expressing the excess of moisture, drying and bagging the bitty, its net value cannot be less than 30s. per ton to the factory, on a low selling price of £3 per ton. A deduction of £2 per ton on the cost of cassava starch is, therefore, apparent.

The cost of production of a ton of cassava starch with a process that only recovers 60 per cent. of the total starch in the tubers is, therefore, only £6 per ton.

COMMERCIAL PROSPECTS.

The starch prepared by Mr. Middleton at Longville was of variable quality at the outset until a satisfactory method of working had been arrived at.

By careful neutralisation of the crude starch with soda, using litmus papers as an indicator, it was found possible entirely to neutralise the organic acids of fermentation that are inseparable from any process of working on cassava tubers. A high-grade starch, free from fibre and dirt, was produced, and this should fetch anything from £15 to £20 a ton wholesale.

A modern plant which obviated the necessity of peeling the tubers by hand would save £1 per ton in the cost of labour for making the starch. A return of at least 20 per cent. of starch, equal to 2 tons per acre, should be obtainable.

It would appear that in cassava starch we have a product that will give us double the financial return per acre of sugar, under ordinary Jamaica conditions, and at a cost of production so considerably less that there is that margin for profit without which no industry can be generally successful in this island.

RECOMMENDATIONS.

The chief requirements for ensuring the success of the industry are the following:—

(1) Capital for installing the best plant for dealing with tubers, so as to eliminate all unnecessary hand-labour, and ensuring the best product possible.

(2) Lands of light texture in a district of moderate rainfall, capable of being cultivated by implements, and within easy reach of the factory.

(3) A good water supply with a system of sand filtration and a covered tank for storing pure water.

These conditions obtain on large areas of alluvial soil on the south side of the island, where bananas languish in an average season for lack of water. A system of "cassava farming" by the local peasantry should be started in connection with each factory.

Experiments to test the most profitable varieties and methods of tillage, cultivation, and management should be organised by the Department of Agriculture.

ANALYSIS OF CASSAVA PRODUCTS FROM LONGVILLE.

Products.	Moisture Total.	Starch Total.	Insoluble Fibre.
Starch A	15·62	76·67	0·32
Starch B	15·89	76·67	0·35
Starch C	17·54	76·60	0·36
Starch D	17·62	78 13	0·42
Bitty	15·13	65·71	3·89
Meal from whole tubers	15·08	65·70	2·45

COTTON NOTES.

COTTON-PICKING MACHINE.

Is it possible that, after so many failures of inventors to produce an effective cotton-picking machine, we are at last to have one which will do the work claimed for it effectually? We note that *Indian Planting and Gardening* of 23rd January has a reference to the invention of a cotton-picking machine. It is claimed for it that it can pick seven bales a day on an average where the yield is as much as a bale per acre.

LECTURES ON COTTON.

The idea put forward by the Imperial Department of Agriculture to provide a series of popular lectures, with lantern illustrations, to be given in connection with the cotton industry, has been received everywhere with great interest. It is hoped by these means to place useful information within the reach of all concerned, and make them thoroughly familiar with the details of cotton cultivation, as also the best methods of dealing with the worm and other pests.

COTTON IN LOUISIANA.

A number of the leading cotton-seed oil mill companies have instituted a movement to induce Louisiana sugar-planters to transform their canefields into cotton plantations next season. High-priced cotton and low-priced sugar is the argument. The companies have offered to erect a number of ginneries in Louisiana, and pay highest prices for cotton and seed or gin at market rates. Acreage data are being compiled, and a big boom is expected in Louisiana cotton-growing. The companies identified with the movement are the Southern Cotton Oil Company, Standard Cotton Seed Oil Company, the Union Oil Company, Columbia Cotton Oil Refining and Manufacturing Company, and Delta Delinting and Refining Company.

SELECTION OF COTTON SEED.

In connection with the purchase of cotton seed for planting purposes, Messrs. W. W. Gordon and Co., in their "Sea Island Cotton Report for 2nd February, 1904," published at Savannah, Ga., U.S.A., warn planters to be careful as to what seed they buy, in the following terms:—

Sea Island planters cannot be too careful in the seed they plant. In some sections, where cotton of excellent staple was produced a few years ago, neglect to replenish with fresh seed has resulted in cotton of weak and irregular staple, which has been almost unsaleable. Island seed will deteriorate after four years' planting on the main, and seed thus deteriorated cannot produce strong staple.

In view of the above facts, and the further fact that strong-staple Sea Island cotton is superior to any other kind of cotton and will always be saleable, whereas weak-staple Sea Islands are not so valuable and can be replaced by other cottons, the necessity for using the best seed must be apparent to everyone.

COTTON IN DUTCH BORNEO.

A specimen of cotton (says an exchange) grown in Borneo was recently submitted for examination to the Director of the Industrial and Commercial College at Enschede, Holland, who reported that it appeared to be equal in fineness and length of fibre to the finer qualities of Egyptian cotton. The length of the fibre was about $\frac{1}{18}$-inch,* and the sample was valued at 4s. per lb.†. It was suggested that the plant yielding this cotton should be experimentally cultivated in order to ascertain the yield obtainable from it.

Inquiries made by the Governor-General of Borneo elicited the following information, which was published in the *Indische Mercuur*, October, 1901:—

The specimen of cotton is the product of a tree occasionally met with on the banks of the Barito River, and known to the natives as "kapas-rampit."

* Possibly another misprint; $\frac{1}{18}$-inch may be meant for $1\frac{1}{8}$ inch.—Ed. *Q.A.J.*

† Possibly a misprint. The price is abnormal.—*Editor.*

When fully developed it attains a height of 13 feet and a circumference of from 15 to 16 inches. According to the natives, it lives about seven or eight years.

The tree does not occur in the wild state, but is occasionally cultivated as a curiosity by the natives. Formerly, when each native household wove its own cotton, the annual variety of cotton was frequently planted, but the product of this is inferior, the fibre being much shorter than that of "kapas-rampit," and its cultivation has, therefore, been abandoned.

Although the "kapas-rampit" grows vigorously in several districts of Borneo, its systematic cultivation has not so far been attempted. No information could be obtained concerning the yield of cotton, but trees were noticed which were covered with flowers or were quite white with the ripe pods.

The flowers are of a yellowish-white colour; the pods are cylindrical in shape, and trilocular, each division containing about eight seeds.

It is possible that this species of Gossypium is not indigenous to Borneo, although it bears a native name, but may have been introduced by the early Dutch trading companies.

The tree grows readily in an argillaceous soil containing a little sand, and is not adversely affected by excess of moisture, which is an important consideration in Borneo, where the climate is humid. Specimens of the leaves and pods sent to Holland were found to somewhat resemble those of "Kapas-borsaar" (*Gossypium vitifolium*), a species cultivated in Java.

Four or five years ago large plantations of a variety of "kapas-rampit" were made near Singapore, but were not profitable, since the cotton fibre produced was brittle, and could not be spun. The variety cultivated at Singapore, however, appears to have been different from that found in Borneo.

The experimental cultivation of the plant has recently been commenced at Boentok.

COTTON v. CANE IN LOUISIANA.

We should as soon have expected the *Mackay Sugar Journal* to advocate the abandonment of sugar-growing in the North for the purpose of substituting cotton as to find that most conservative of sugar journals, the *Louisiana Planter*, approving of planting up sugar lands with cotton. Yet we find from the *Florida Agriculturist* that since the price of cotton has run up to such a high figure many sugar and cotton planters intend to largely extend the area under cotton.

The *Louisiana Planter* publishes this item, not only without condemnation, but with tacit approval. That journal says:—

The very high prices that are prevailing for cotton, which promise to continue anyway for a year or two to come, are leading our sugar-planters to divert some of their lands to cotton-planting. Many fears have been expressed as to the scarcity of adequate ginning capacity, and this more particularly when we remember that the yield of lint cotton is only about one-third of the mass that has to be handled. The freightage on the triple amount to any distant point is a serious embargo on the trade, and to relieve this a number of our cotton oil companies will agree to erect a first-class ginning establishment, and will gin the cotton at customary prices, or will purchase the seed cotton, as the planters may decide. The whole matter is one of conspicuous interest at the present time, and we are sure will help to solve one of the chief difficulties that suggests itself to our sugar-planters.

Just below the above article we find in the same paper another article on the same subject:—

The diversion of some of the canefields of Louisiana to the cotton industry continues to attract considerable attention, and was the topic of an interesting editorial in a recent issue of the *Times Democrat*, in which, among other matters, it referred to the great Belle Alliance plantation, in Assumption parish, owned by Mr. James P. Kock, as one of the plantations that was likely to change its culture in this way to some considerable extent. As Mr. Kock has for many years been a leader in the great development of the Louisiana sugar

industry, his conclusions in regard thereto are a matter of great interest to all those connected with the industry, and what he may say in regard thereto is sure to have much influence.

Mr. Kock responded to the editorial in the *Times Democrat* by a letter to that journal, in which he indicates that, while intending to devote a considerable area of land to cotton culture, this does not mean a diminution of his efforts in the sugar-cane industry. In this connection, and very pertinently, Mr. Kock says as follows:—

"Such an innovation in the sugar district of Louisiana becoming known has, perhaps, led to the conclusion that cotton will replace cane with us, but this does not follow.

"Cotton-growing in this section of the sugar district is, however, by no means an untried thing, and it may be of interest to you to know that for several years during the war cotton was successfully grown on Belle Alliance plantation by Mr. Charles Kock, father of the present owners, who founded the business.

"We have a very large acreage devoted to the cultivation of such crops as are usual on large sugar plantations, and any increase in the acreage devoted to cotton is not necessarily a step towards going out of the cane-raising business, nor does it necessarily mean even a curtailment. In our case it is the intention to reduce the acreage of corn to some extent to make room for cotton, if it is found necessary, but, as neither cotton nor corn-planting time has arrived, we will be influenced in this respect very much by conditions as they are when the proper time arrives to act; but it is by no means our intention to slight the cultivation of cane or the manufacture of sugar, in which we have been engaged for so long a time.

"Large sugar plantations, with heavy investments in machinery and equipment for harvesting cane and manufacturing its products, to say nothing of the value of seed cane, &c., cannot easily make radical changes in their methods and turn lands to the cultivation of a crop not requiring the use of their manufacturing plants, but in the light of present prospects some diversification can be easily undertaken without materially affecting the main business engaged in."

From this we may judge that on the Belle Alliance plantation, and doubtless on many other large plantations in the State, experiments in cotton-raising on a large scale will be engaged in. We are told that for this purpose lands can be utilised that are not ordinarily profitable in cane culture, and the results of the experimentation during 1904 may have quite a bearing upon the future of both the sugar and cotton industries of this State.

COTTON AT ST. VINCENT.

In reference to the notice that appeared in the last issue of the *Agricultural News* relative to the purchase of cotton at the St. Vincent factory, we (*Agricultural News*, Barbados) extract the following from the rules and regulations that have been drawn up for the factory:—

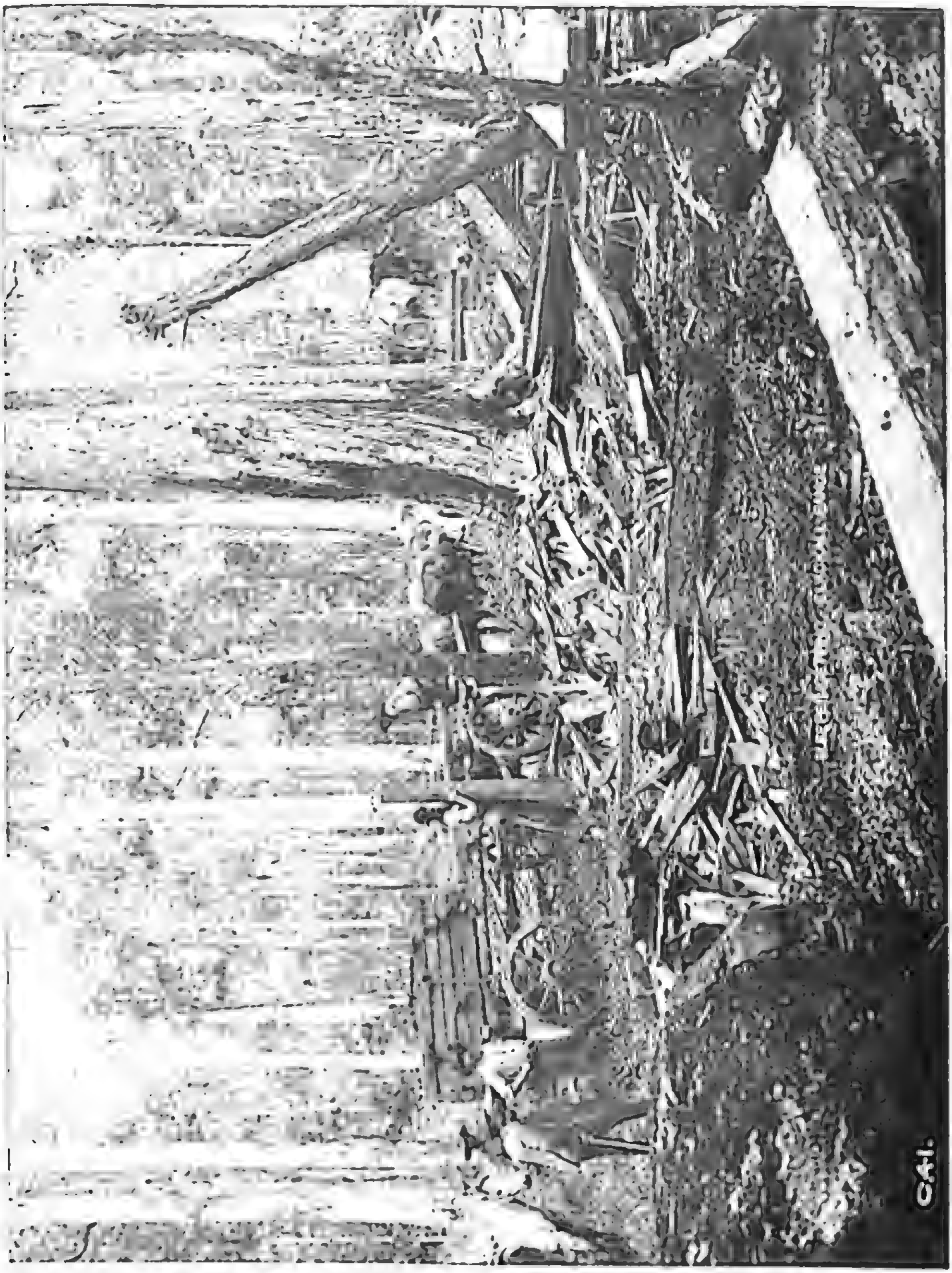
For carefully picked and dried Sea Island cotton, free from leaves, trash, &c., the charge for ginning and baling (and shipping, if desired) will be at the rate of 3 cents (1½d.) per lb. of lint. The seed will be returned to the grower provided he supplies bags for the purpose.

N.B.—The usual proportion of lint to seed cotton is at the rate of 23 lb. to 26 lb. of lint to every 100 lb. of seed cotton. Unless the seed cotton is very thoroughly dried and well picked beforehand, there is usually a loss in ginning ranging from 2 lb. to 5 lb. per 100 lb. of seed cotton.

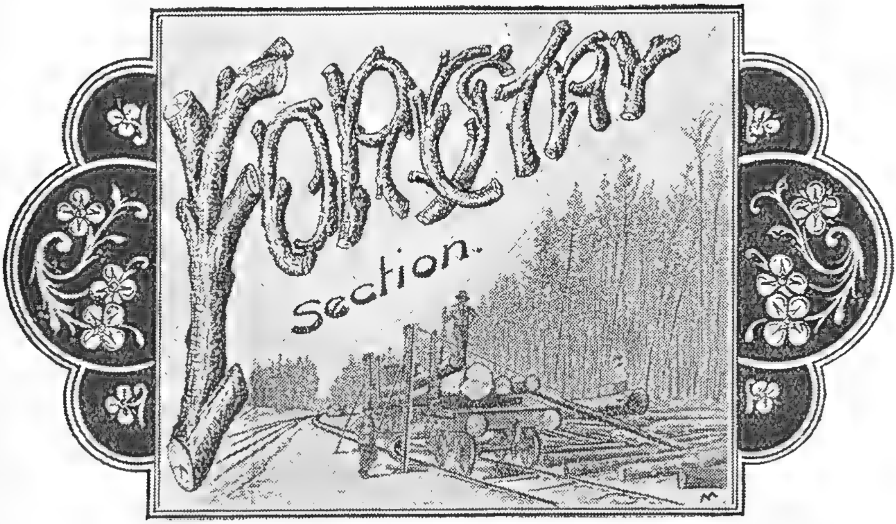
Small lots of Sea Island cotton, if clean and well picked, will be purchased at the factory at the rate of 4 cents (2d.) per lb. of seed cotton. In this case, the seed will not be returned.

The above price of 4 cents per lb. paid for Sea Island cotton is equivalent to payment at the rate of about 11d. per lb. for the lint on the Liverpool market.

Plate I.



Sleeper-getting on the Blackall Range, Queensland.



Conducted by PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

RAILWAY SLEEPERS.

A brisk demand has arisen for railway sleepers of Australian woods, and inquiries are being made from several quarters as to the quantities available and the prices at which they can be landed in various parts of the world. Several large orders have been secured for South Africa, inquiries are now being made for 2,000,000 for the Far East, and in the near future it is expected that the extension of American railways in the Philippines will open up a payable market for large quantities of Australian sleepers in that quarter.

The advantages of Australian hardwoods over the woods used for sleepers in Europe and America are briefly:—The life of an average sleeper made of Australian hardwood is three times longer than that of one made of the woods ordinarily used in Europe and America, and the transverse strength of the Australian sleeper is so much greater that a smaller section, and therefore less wood, suffices than in the case of sleepers made from other wood. That this has been discovered in the British Possessions in South Africa is evident from the following extracts from a letter written in August, 1903, to a London paper by the Conservator of Forests to the Government of Cape Colony. The letter also illustrates incidentally the trouble and expense which the South African Governments are taking to do what Australians are themselves neglecting—that is, to grow Australian timbers in accordance with modern forestry principles. Mr. Hutchins says:—"There are probably more eucalypt plantations in South Africa than in any other country, and at the present rate of progress there will be, in a few years, more eucalypt plantations in South Africa than in all the other countries combined. There is no group of trees in the warm temperate regions of the world that can produce hardwoods of good quality so rapidly and cheaply as eucalypts, and their cultivation bids fair to become the central factor in the forestry of these regions. At this moment trainloads of eucalypt timber are pouring into South Africa, eucalypt sleepers displacing metal and creosoted pine sleepers. South Africa will soon be paying out something like a quarter of a million pounds yearly for eucalypt timber imported for sleepers and mining timber. Little or none of this, by the way, is *Eucalyptus globulus*, the Tasmanian blue gum." The length of time which sleepers will last in use depends on many things, such as the nature of the soil or ballast upon which they are placed, the frequency and weight of traffic, the soil in which the tree has been grown, the elevation and position in which it has been grown, the moisture or dryness of climate, and other considerations which will readily

suggest themselves. The species of the tree is not always a certain indication of the quality of the sleeper which may be cut from it. Thus ironbark cut from the alluvial tracts of the North Coast district will not last nearly so long as timber from the same species of tree cut from, say, beyond Chinchilla; and this is true of nearly every species of tree, with infinite variations as to climate, soil, and exposure. It will be seen, therefore, that tables as to the life of sleepers can only be generalisations, isolated examples of much longer and much shorter duration for the same species of timber being familiar to all who have studied the subject. Of Australian timbers it may be said that ironbark and gray gum will last from 25 to 30 years, red gum from 24 to 30 years, jarrah about 25 years, blue gum about 20 years, karri about 10 years, second-class hardwoods about 10 to 12 years. Of New Zealand timbers, kauri is stated to last up to 15 years; yellow pine, totara, and puriri, about 20 years. Of American timbers, white oak, yellow pine, and cedar last from 6 to 10 years, chestnut and tamarack from 5 to 9 years. Of European timbers, oak lasts from 10 to 16 years, larch from 8 to 10, and Scotch pine from 7 to 9 years. When, however, European timber is creosoted, its life is considerably prolonged. To do this the sleepers are placed in an iron cylinder from which the air is exhausted. Creosote, heated to a temperature of 120 degrees, is then pumped into the cylinder at a pressure of 120 lb. to the square inch. Each sleeper, which contains $3\frac{1}{8}$ cubic feet of timber, absorbs 3 gallons of the creosote. Treated in this way, oak lasts from 10 to 25 years, Scotch pine from 13 to 22 years, beech 13 to 27 years, spruce 6 to 9 years. This, however, increases the cost of the sleeper, and I find from a reference to a specification of the Midland Railway that sleepers so treated cost 4s. each, which, according to the terms of a recent contract, is a higher price than can be procured for sleepers from Queensland landed in South Africa. It may be interesting to note that, according to the specification above alluded to, old sleepers when removed sell in England for 9d. each. In the "Scientific American Supplement" for 5th September, 1903, will be found a most interesting description of a new process for the preservation of timber, which is now being accorded extended trials in several quarters. This is called Powellizing, and consists in the boiling of the timber in a solution of sugar. The timbers specified by the Queensland Railway Department for sleepers are ironbark, spotted gum, tallow-wood, red stringybark, messmate, and grey gum. In New South Wales the Railway Department accept sleepers of ironbark, tallow-wood, spotted gum, black butt, brush box, grey box, mahogany, grey gum, red gum, and blue gum.

The following table, compiled from various sources, shows sizes in which sleepers are required in several places:—

DIMENSIONS OF SLEEPERS.

Length—feet.	Breadth—inches.	Depth—inches.	Area of Section—square inches.	Cubic Feet.	Superficial Feet.	Where Used.
10	12	6	72	5	60	India. Broad gauge.
9	8	6	48	3	36	America.
9	10	5	50	3·12	37·44	New South Wales.
8·92	10	5	50	3·11	37·32	United Kingdom.
8·85	10·25	6·31	64·67	3·97	47·64	German Empire.
8·53	10·20	5·10	52·02	3·08	36·96	France.
8·50	9	7	63	3·72	42·64	America. Pennsylvania line.
8·33	9	4·50	40·50	2·34	28·08	Johannesberg tramways.
8	9	4·50	40·50	2·25	27	New South Wales.
8	8	6	48	2·66	31·92	America. Two millions wanted for East.
8	8	4·50	36	2	24	India. Narrow gauge.
7	10	5	50	2·43	29·16	S. Africa. Now being cut in Queensland.
7	9	4·50	40·50	1·96	23·52	Queensland Railways.
7	8	5	40	1·94	23·28	Manila.
6	8	5	40	1·66	19·92	Manila.

It is not easy to form an adequate idea of the enormous demand for timber for railway sleepers. In Australia, where, in consequence of the superior nature of the timber, such frequent renewals of sleepers are not necessary, the consumption is less than in other parts of the world. But it is, nevertheless, very great. It is officially stated that the yearly consumption on the 3,300 miles of railway in Victoria is 300,000 sleepers annually. At this rate the 13,820 miles of railway in the Commonwealth must use 1,256,000 sleepers every year. In Queensland the consumption is 200,000 annually for 2,900 miles of railway; but much of this railway has only recently been made, and as time goes on the consumption will become much greater in consequence of the greater need for renewals. It is computed that in Europe alone the annual consumption of timber for sleepers amounts to 1,060,000,000 cubic feet or 21,200,000 loads. In 1890 it was computed that there were in the world 360,000 miles of railway, and a writer on the railways of America in 1902 stated that a fair proportion for the miles of line open in that country would be 3,000 sleepers per mile. At this rate the railways of the world would absorb the enormous total of 3,240,000,000 cubic feet for sleepers requiring frequent renewal. On the Midland Railway there are 2,000 sleepers to the mile of single line. In America about 2,145 sleepers go to the mile of single track, and in Queensalnd about 2,500.

From the foregoing it will be seen that we have, in the fringe of forest land which skirts the seaboard of this enormous island-continent of Australia, the best sleeper timber in the world, and that there is every probability of the demand increasing as time goes on. Indeed, when we come to consider that Great Britain annually pays away for timber the enormous sum of £25,000,000, that there is a growing demand on the part of the British people that foreign products of this sort shall be taxed, thereby offering a better market for Australian produce of the same kind, and that new railways are being opened up in South Africa, the Philippines, China, Japan, and elsewhere within what may be called the sphere of influence of Australian commerce, we must conclude that the prospect of our sleeper trade is rosy.

There is another aspect to the matter, however. Can we long go on meeting this demand with our present unnecessary forest destruction? Let us see what a few of the leading Australian newspapers have to say on the subject.

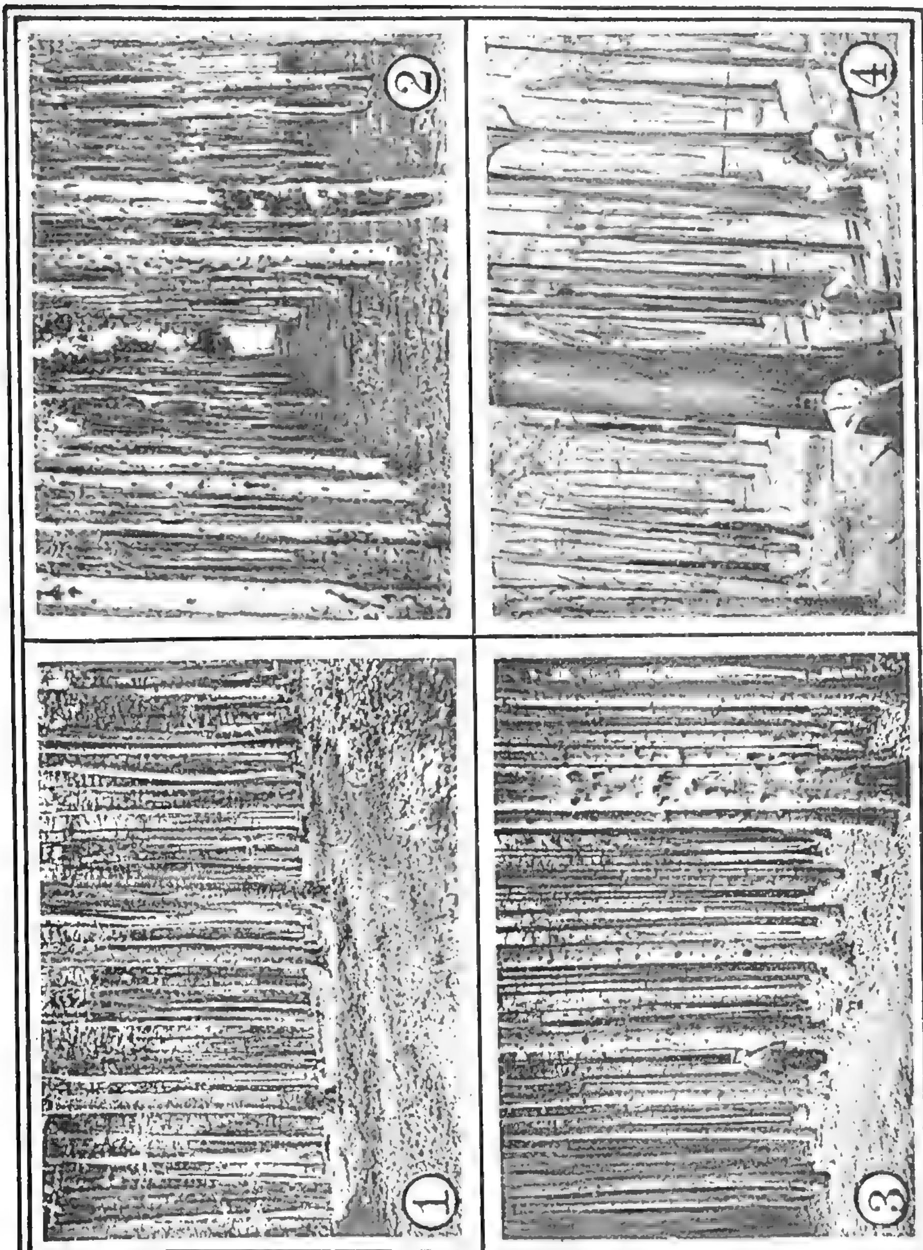
The Melbourne *Age* of 28th January, 1903, in a leading article, complains:—"The Railway Department is trying to block the letting of a contract to employ a thousand men in cutting sleepers for South Africa." After pointing out that the real development of South Africa is only just about to begin, the article proceeds: "Through hundreds of miles of treeless veldt the railway tracks are to be conducted, and almost every sleeper that is required will have to be brought from over the seas. Victoria, on the other hand, has 4,000,000 acres of forest reserves on which, by the exercise of the most rudimentary rules of prudence, the Lands Department might have had noble forests ready for the axes of the hewers." And on the 9th February of the same year it is stated as the opinion of the Forestry Department of Victoria that "it is questionable whether at the present time (excluding the more remote forests) Victoria can do more than supply her own requirements. The best sleeper timbers are ironbark, red gum, and grey box. Enormous quantities of red gum have been cut, and the available supplies on Crown reserves are very limited, being principally confined to the Barmah and Glenbower Forests, embracing about 200,000 acres along the fringe of the River Murray." It would appear from this that "the magnificent timber resources" of Victoria are sadly in need of that attention which appears to have been over long delayed. But all this is the better for the other States with a timber supply more readily available. So we turn to the leading journals of New South Wales for some guidance as to the state of forestry affairs there. On the 9th February, 1903, the Premier of New South Wales was enabled to express great gratification in being able to make the announcement that a contract for 500,000 sleepers for South Africa had been secured through the instrumentality of the Government at a rate of 4s. 11d.

per sleeper. It was a source of considerable satisfaction that this contract would employ a large number of hands, and would be a source of revenue to the Government in royalty and freight on the State railways, to say nothing of the advantages of shipping 40,000 tons oversea. On the 16th of the same month, however, it was pointed out by the *Sydney Morning Herald* that "some of the officers of the Works Department do not view with favour the unrestricted export of railway sleepers. The officers in question, who are connected with that branch of the department which undertakes the construction of railway lines, are of opinion that the matter is one which ought to be seriously considered; otherwise, in a very few years to come, the price of sleepers will increase, by reason of the greater difficulty in getting them, with the result that the cost of building new railways will be materially increased. The Railway Commissioners also point out that they are customers for railway sleepers to the extent of 200,000 a year, and state that even the export of sleepers to the New Zealand Government has on more than one occasion interfered with the desire of the department to obtain a speedy delivery of railway sleepers." The Railway Commissioners and their officers would appear to have exceptional facilities for forming a reliable judgment on this matter. In the *Sydney Morning Herald* of 9th June, 1904, there is a paragraph which demands more than passing interest. It states that there are 100 timber sleeper-getters with carts getting 60,000 sleepers in the country around Narrabri, and that they are compelled to haul the sleepers for a distance of from 20 to 26 miles into the station at Narrabri. The prices which they receive are 2s. 11d. for small sleepers and 3s. 9d. for large sleepers, on the trucks, with a deduction of 3d. and 4d. for royalty. This haulage of 20 to 26 miles means that the sleeper timber has been all cut off 1,000,000 acres around the station of Narrabri, a railway town with 7 sawmills, in the centre of an ironbark district, and situate about 250 miles inland from the port of Newcastle. It needs no great foresight to enable the conclusion to be reached that the increasing distance will soon balance the price obtainable in such a way as to render it not worth while to haul the ironbark at all, except at ruinous cost to the people who must have the sleepers. This may mean pastoral and agricultural settlement, which are good, and it is only used as an illustration.

Now let us turn to Queensland. I quote from the *Brisbane Courier* of the 12th June, 1903:—"It is not believed by the railway officials that there will be any chance of Queensland developing an export trade in railway sleepers owing to the comparatively short supply. Indeed, it is said that there is hardly sufficient for local demands; at any rate, the sleeper-getters have to go further back, and this will tend to increase the prices. The Railway Commissioner, when travelling on the North Coast line, where the department has a considerable number of sleepers stacked, was heard to give expression to similar ideas recently. It is thought that New South Wales is not in a much better position, and a gentleman with much knowledge of the subject described its policy as like a dog eating its tail, since the State Government, in a few years, will have to pay heavy prices for all the sleepers it requires."

Following this there was a series of able articles on the Queensland Timber Trade, in which the need of an export trade in timber was strongly insisted on. It somehow seems to escape the attention of persons who are always insisting on "our magnificent timber resources" that timber which it will not pay to haul from the position it occupies, and which cannot be placed on rail or ship at a payable price, might as well be in the moon for all the value it is to the community at large, except for the purely hygienic and water-conserving value it has, and that even the former of these is largely discounted by remoteness. As soon as the vanguard of civilisation reaches the nearest timber, the latter also will be recklessly destroyed without forethought or consideration. There is no reason, save the lack of ordinary prudence, to account for the fact that our centres of commercial industry are not like those of Germany, within a few miles of noble forests always yielding a bountiful wood harvest, but never exhausted. A small population like that of Queensland can destroy in a few years more forest than it can replace in as many centuries.

Plate II.



1. BEECH AND OTHER HARDWOODS, EUROPEAN FOREST.
2. ARTIFICIAL EUCALYPTUS PLANTATION, AUSTRALIA.
3. FIR FOREST IN EUROPE.
4. NATURAL EUCALYPTUS FOREST, EAST COAST, AUSTRALIA.

Within the past few days a contract for the supply of 300,000 sleepers has been taken up in Queensland, and it is unnecessary to point out the indirect advantages which such a contract means to the community at large. It means work for several hundreds of men, the circulation of their wages, increased shipping to the ports, and in any European country or in any part of India it would mean improvement to the forests.

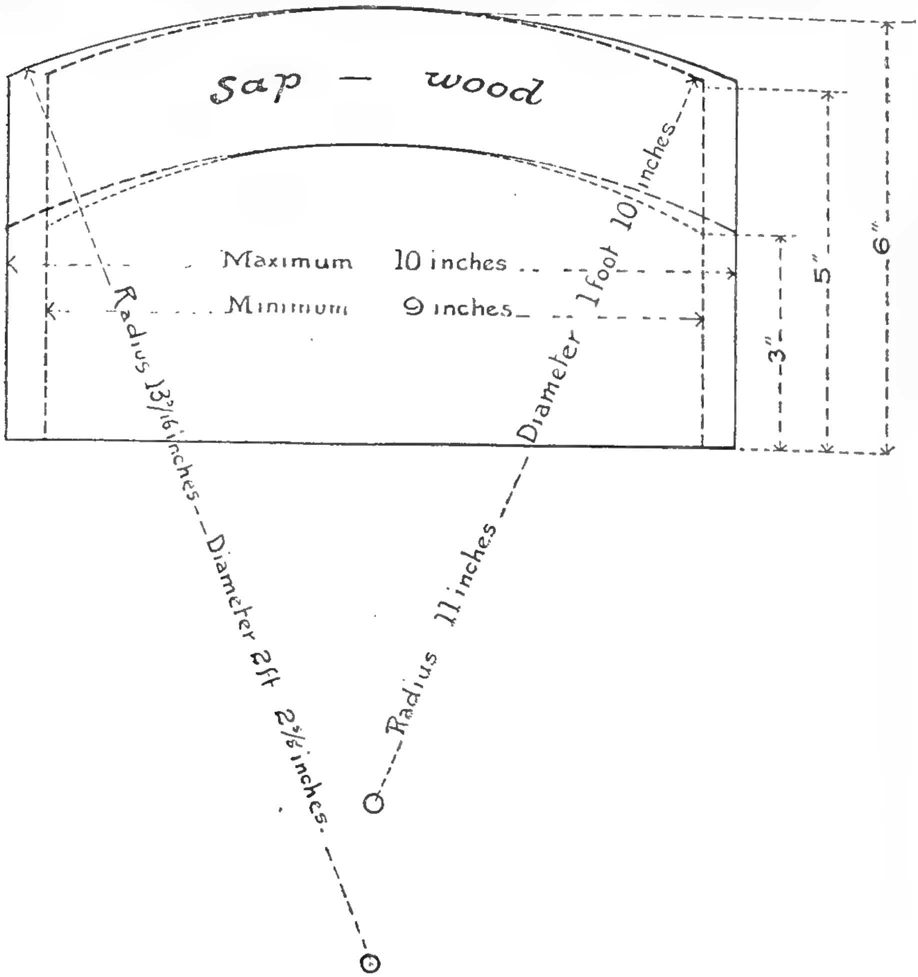
Let me illustrate what I mean by means of the set of pictures on the opposite page. No. 1 shows a European forest of hardwoods, chiefly oak and beech. You note that they stand like a field of corn on a huge scale. Every trunk is straight as a lance shaft. The crowns are away in the light. The canopy of that forest has never been broken by the so-called thinning which the old-world foresters delighted in. It has been watched by loving and careful eyes. Its growth has been regulated by plan. Its yield has been measured by system. Taking sleepers from this forest will improve it, and other sleepers will be ready when the period of the established rotation comes round again, and the forester can tell to a cent what has been the revenue and the cost, the yearly increment of timber and the percentage of profit, and all things necessary for working the forest on a scientific scale, be it large or small.

No. 2 is an artificial plantation of hardwoods (sugar gums) in Australia. taken from an official report. No one will deny that it is immeasurably superior to the natural forest immediately below (No. 4), but it is more open than either No. 1 or 3, and, in my judgment, unnecessarily so. The greater the number of trees which can be successfully grown on a given area of land the greater the profit, and if the correct medium is maintained the more perfect the timber. That natural forest can be made to produce, maintain, and reproduce under careful management crops of trees very much more dense than they have borne in a state of nature is one of the truisms of what has been styled "The New Forestry." No. 3 is a dense forest in Germany. The species is larch. It will produce itself naturally. Compare it with the open natural forest on the coast of New South Wales (No. 4); yet the forest shown in No. 4 will grow as evenly and as densely as that in No. 3. For illustrations Nos. 1 and 3 I am indebted to Simpson's admirable book, "The New Forestry"; and for Nos. 2 and 4 to Government Reports.

Were our forest lands worked in such a way as even to show some approach to the type exhibited in illustrations Nos. 1 and 3, there would be no doubt whatever as to the ability of Australia to supply the world with the finest sleepers which have ever been procurable on the face of the planet; and no stimulus in the shape of reduction of freights or royalty would be necessary; and there would not be the present inducement for the Governments of Cape Colony and the Transvaal to extend their closely-planted eucalyptus plantations, as they are now doing. It will be a truly remarkable thing if, when we have destroyed our forests within payable haulage distance of our railway lines, we find it cheaper to import plantation eucalyptus timber from Durban or Delagoa Bay than to haul our own inaccessible timber. The contingency is not really so remote as it may look. We have already reached the absurd point of importing into Sydney from Natal quantities of New South Wales wattle bark grown in South Africa. The reports of Mr. Valder, the Commercial Agent for New South Wales in South Africa, upon this subject, are strange reading, taken in conjunction with the reports of the Conference on the unemployed.

It is generally admitted that a very great deal of needless damage is done in the forests of Australia by the practice of cutting up small trees for sleepers. There is no doubt that the practice largely exists. The Press of Australia has always been the strongest supporter of rational forest management, and the *Sydney Morning Herald*, early this year, sent a commissioner to investigate the subject on the North Coast. I quote his words from the *Sydney Morning Herald* of 9th March, 1904. At the conclusion of a graphic account of the industry, he says:—"The situation is now becoming serious. . . . Along the whole of the North Coast as soon as a sapling is 18 inches or 20 inches through, a teamster cuts it down, whereas if it were left for twenty or even fifteen years it would yield four or five times what it does to-day. There is no

restriction (said one expert)—the men may hack and cut as they choose. It is no advantage to the saw-miller or consumer." To minimise the temptation to cut down young trees easy of access, and to enable piped trees to be used for sleepers, the Railway Department of Queensland has approved of sleepers of which a diagram, kindly furnished me by the Railway Department, is here



reproduced. It is a round-backed sleeper, and a reference to the diagram will show that out of a log having a diameter of 26 inches, and having a pipe of as much as 14 inches in diameter, five sleepers can be got. The sapwood is not removed, but the sleeper must have 3 inches of redwood on the outside. The alternative radii are so proportioned that the sleeper cannot be cut from a small log. The use of this sleeper is encouraged by the Queensland Railways, and a general adoption of it would serve in using up many otherwise useless trees which at present cumber the forests and feed fires or harbour injurious insects.

There is one rather important point in connection with Australian hardwood sleepers for the export market, which may well be borne in mind. The jarrah sleeper of Western Australia reaches the railway engineer a neat, square, cleanly-cut piece of timber. It is a "pretty" sleeper. The bush-hewn sleeper, cut and squared by "the man behind the axe," is, on the other hand, not nearly so presentable. It is a much better sleeper. It will last longer than if it had been sawn and neatly squared by machinery. Its straight-grained sides do not present, like the "fuzzy" surface left by the saw, a resting place for the spores of destructive fungi, nor does it absorb moisture so readily. But nine men out

of every ten who have not had a practical experience of these timbers will award the palm to the cleanly-cut, nicely-squared, and business-like looking sleeper in preference to its more homely-looking bush-made brother.

This is a point which needs to be explained to everyone—engineers, contractors, foremen, and others—having to do with these sleepers at the places where they are used. Our hardy bushmen cannot do this for themselves, but, in the dissemination of practical information of this nature in the right quarters, an authoritative State Department can do most excellent work.

TIMBER IMPORTS AND EXPORTS OF THE COMMONWEALTH.

Through the courtesy of the Comptroller-General of Customs of the Commonwealth, I have been furnished with a return specially prepared showing the quantities of timber imported into and exported from the Commonwealth for the last three years, and also the respective imports and exports of each State, showing the quantities, values, and classes of timber. These figures, which are too voluminous for insertion here, are of more than passing interest to everyone connected with the timber industry in any of its aspects, or with the forests of the Commonwealth.

They show that, notwithstanding our 100,000,000 acres (and over) of good forest country, and an extra 150,000,000 acres of inferior forest country, we imported during the three years ended 31st December last, timber to the value of £3,252,202, or £1,084,067 per annum, being 5s. 8½d. per head of the population. The United Kingdom, with hardly any forest of its own, and with enormous railway, shipbuilding, and manufacturing industries, and with buildings necessary for its population of 350 people to the square mile, and having to import almost every stick of timber used by 42,500,000 people, only imports twice the value per head of the population, or 11s. 9½d.

The following table shows the relative positions of the two countries in this matter. Every stick of the timber for which we send out of the Commonwealth £3,250,000 sterling every three years, while men are tramping our pavements in search of work, can be produced in our own country. To assert the contrary were not only to libel Australian soil and climate, but to fly in the face of the facts as every Australian knows them to exist:—

TABLE showing COMPARATIVE TIMBER IMPORTS, AREAS, and POPULATIONS of the COMMONWEALTH of AUSTRALIA and the UNITED KINGDOM. (Odd hundreds omitted.)

—	Area in Square Miles.	Population.	Persons to the Square Mile.	Value of Timber Imported Yearly.	Value per Head of the Population.
				£	s. d.
Commonwealth of Australia ...	2,972,000	3,788,000	1¼	1,084,000	5 8½
United Kingdom	121,000	42,372,000	350	25,000,000	11 9½

As regards export, I have prepared the following analysis of the figures, from which it will be seen that Western Australia is the only State of the group which makes much show as an exporter of native-grown timber:—

TABLE showing the QUANTITIES and VALUE of AUSTRALIAN TIMBER EXPORTED from the several STATES of the COMMONWEALTH during the YEARS 1901-2-3.

—	1901.		1902.		1903.	
	Feet.	Value.	Feet.	Value.	Feet.	Value.
		£		£		£
New South Wales ...	12,001,490	121,250	11,239,665	99,445	19,424,724	133,553
Victoria	67,603	644	46,001	455	595,165	4,981
Queensland	56,146	3,036	133,447	1,237	109,850	1,068
South Australia ...	42,520	304	...	40	...	...
Western Australia ...	76,348,035	508,141	64,916,420	432,070	89,261,443	595,077
Tasmania	4,482,700	15,604	2,934,697	10,984	3,778,657	18,923
	92,998,494	648,979	79,270,230	544,231	113,169,839	753,602

Of the £753,000 worth exported by the Commonwealth in 1903, Western Australian forests netted £595,000, and all the exports were valued at about 13s. 4d. per 100 superficial feet. It will be remembered that three sleepers of the larger size measure 112 superficial feet.

The figures, kindly supplied by the Customs authorities, do not take any note of interstate movements of timber, relating solely to oversea trade with the Commonwealth.

DEFORESTING.

Some twenty years ago it was found by tea-planters in Ceylon that, whilst good tea was grown at the sea-level, much more delicate leaf could be produced at elevations rising to 6,500 feet. The Government had long since been warned that if the mountain tops were cleared of forest the rainfall would be seriously affected, and a decrease in the rainfall over the whole island might result. An Act was then passed by the Ceylon Legislative Council to stop the sale of all Crown jungle land at elevations of 5,000 feet and upwards. Those tea-planters who had bought land at this elevation before the passing of the Act are to be congratulated, but the authorities can scarcely be congratulated for their wisdom (?) in permitting the denudation of hill tops, seeing that long experience in other countries has proved how detrimental such deforestation is to the country at large.

TIMBER FOR SOUTH AFRICA.

The *Natal Agricultural Journal* takes from the *Timber Trades Journal* some very trite remarks on a forestry policy for South Africa. The writer says:—"To anglicise South Africa, you must first make the country attract the Englishman as a permanent resident. To do this, you must reduce the cost of living. To reduce the cost of living, you must foster the production of local foodstuffs. To produce local foodstuffs, you must endeavour to induce a regular rain supply. To encourage a local rain supply, you must have forests. To have forests, you must plant trees. Quite apart then from the question of the value of local timber as a product in itself, a practical policy of forestry has an imperative *raison d'être* in the interests of the public welfare."

From British ports alone South Africa imported £1,937,159 worth of timber in 1902. Queensland is a British port, and we trust we shall see the present demand for 500,000 railway sleepers for South Africa secured by a Queensland firm.

But a few tenders like this, if supplied from our forests, will have a considerable effect on future supplies. These must be provided for at all costs as soon as practicable, whether by nursing existent forests or by replanting denuded forests or planting up areas now devoid of timber. We are doing everything for posterity, and providing a regular timber supply for coming generations is not the least of our duties to them.

SISAL HEMP PLANTS, CASSAVA.

As already announced in this *Journal*, the Department of Agriculture will supply to each applicant for plants sufficient to plant one acre—that is, from 700 to 800 plants, free of charge, delivered at the Queen's Wharf, Brisbane. There are several intending planters who wish to start at once with from 5 to 10 acres. So many applications for plants have reached the Department that it is not possible to supply demands which run to as much as plants for 100 acres. We learn, however, that plants may be obtained, to a limited extent, at Childers, North Coast line. These plants are twelve months old, and just ready for planting out. Mr. H. T. Wells, of Farnborough, Childers, will, on application, furnish all particulars concerning them. Cassava cuttings also can be obtained in any quantity at Childers.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table Showing the Total Rainfall for each Month of the Year in the Agricultural Districts of Queensland.

Stations.	1903.								1904.				
	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.
North.													
Bowen	2·04	2·77	0·31	0·22	0·51	1·36	3·14	6·13	3·45	2·65	1·12	0·31	0·25
Cairns	1·67	0·51	0·87	0·44	0·47	0·91	3·10	13·51	10·03	10·55	15·73	13·33	3·21
Geraldton	7·46	3·12	2·07	7·08	3·79	3·05	7·13	37·86	24·37	14·04	31·09	38·73	11·81
Herberton	0·64	1·00	0·19	0·33	Nil.	0·67	6·21	15·52	8·01	5·16	18·25	7·08	1·55
Hughenden	1·73	Nil.	0·07	0·31	0·65	0·80	2·36	5·30	2·71	2·80	1·93	1·33	0·07
Kamerunga	2·14	0·50	1·10	1·50	0·86	1·39	4·94	14·33	7·37	9·39	22·35	15·48	3·50
Longreach	3·51	Nil.	0·69	Nil.	1·58	0·90	0·83	1·76	1·77	2·69	1·01	0·31	2·78
Lucinda	6·36	2·44	2·38	4·39	0·30	0·76	10·67	40·31	11·71	8·40	22·40	11·30	4·00
Mackay	6·75	2·49	2·53	0·59	0·44	1·54	9·86	5·52	16·74	3·17	5·69	5·24	3·61
Rockhampton	6·93	0·08	3·73	0·68	0·54	1·84	7·42	4·08	5·12	3·50	5·11	13·82	0·77
Townsville	2·08	1·02	0·05	0·19	0·44	2·42	5·97	19·02*	5·48	5·19	4·01	1·03	0·24
South.													
Barcaldine	4·92	Nil.	0·90	0·50	4·23	1·01	4·00	0·92	3·26	0·96	0·11	1·19	3·85
Beenleigh	12·40	0·92	5·04	2·26	4·13	3·29	4·78	1·60	2·81	1·25	8·06	14·99	6·17
Biggenden	1·28	2·07	3·90	1·62	2·23	2·77	4·37	5·62	7·48	0·71	3·16	2·92	2·29
Blackall	5·19	Nil.	1·81	0·75	2·25	0·45	2·56	1·79	2·28	3·67	0·39	3·76	3·08
Brisbane	11·82	0·73	5·56	3·84	4·73	3·65	3·98	2·19	2·65	0·77	7·07	7·23	4·04
Bundaberg	11·55	0·33	5·98	0·88	3·55	0·43	3·25	9·97	3·18	0·85	4·26	5·64	1·32
Caboolture	16·14	0·92	6·08	3·27	4·41	3·11	9·98	4·18	4·29	1·32	8·48	9·90	4·66
Charleville	2·94	0·02	1·61	0·62	3·40	0·95	2·20	2·98	1·87	2·56	4·60	3·62	3·07
Dalby	6·00	0·03	3·78	2·30	3·30	3·12	6·30	1·19	1·88	3·20	4·74	0·40	4·69
Emerald	3·43	0·02	0·57	0·24	1·28	1·90	2·21	4·30	2·70	1·26	4·14	5·88	1·23
Esk	9·27	0·30	2·97	4·21	4·86	3·69	4·02	1·43	2·37	1·86	3·18	4·91	3·99
Gatton College ...	7·55	0·17	4·15	2·50	3·56	4·71	5·05	1·04	2·15	1·20	4·17	2·59	3·79
Gayndah	6·03	0·05	2·81	1·06	2·62	4·37	3·03	5·12	7·01	1·83	2·97	1·63	1·61
Gindie	3·31	Nil.	0·51	0·30	1·58	1·97	4·06	4·26	1·52	1·40	1·83	4·81	1·65
Goondiwindi	5·07	0·15	4·38	2·09	4·22	2·16	3·73	3·62	2·90	2·65	7·32	0·37	3·40
Gympie	10·20	0·62	1·67	2·72	2·42	5·61	4·50	4·88	9·27	1·80	3·32	10·86	4·11
Ipswich	9·56	0·85	3·64	2·70	5·24	2·98	3·84	1·01	4·07	1·72	3·55	4·71	3·50
Laidley	8·20	0·20	4·65	3·06	4·25	5·47	3·87	1·82	2·93	1·35	5·36	2·83	3·12
Maryborough	9·58	1·60	6·17	1·09	1·93	2·62	3·96	5·04	2·64	0·56	3·94	10·07	4·42
Nambour	19·46	1·29	5·38	3·95	3·60	3·85	6·13	2·43	6·39	1·91	10·30	15·43	6·94
Nerang	15·75	2·36	7·34	2·21	3·81	3·52	3·83	4·24	3·89	0·85	11·18	13·83	7·52
Roma	3·17	0·34	2·26	1·13	6·61	1·92	3·16	4·21	1·85	0·59	2·32	5·06	3·73
Stanthorpe	6·87	0·74	4·71	1·98	6·07	3·45	4·45	2·59	2·29	1·33	6·57	0·71	4·11
Tambo	1·96	0·01	2·64	0·27	4·33	1·08	3·17	2·91	2·48	1·72	1·26	5·46	3·96
Taroom	8·83	0·23	3·83	2·21	1·51	2·05	3·76	3·22	1·39	2·79	1·58	2·21	3·49
Tewantin	20·22	7·42	7·09	5·70	5·80	2·85	9·85	1·37	3·03	2·59	19·55	30·39	9·20
Texas	4·34	0·36	4·53	3·21	4·55	2·47	4·83	4·44	1·70	3·67	5·72	0·03	2·99
Toowoomba	7·94	0·34	3·90	3·00	4·06	3·82	4·85	4·27	4·26	3·98	4·76	3·29	4·08
Warwick	8·62	0·10	5·45	2·63	3·41	2·89	3·92	2·73	0·60	2·91	5·74	0·66	2·85
Westbrook	4·23	2·53	3·89	1·63	3·89	4·03	5·11	3·75	1·46	2·82	3·49	9·00	3·18

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

Butter.—Australian, 84s. to 86s. Queensland butter is not separately quoted in Weddell and Co.'s Colonial Dairy Produce Report. Danish, 93s. to 95s. (Danish has since risen 4 kröner (6s. 6d.) per cwt.)

Cheese.—Canadian, 42s. to 43s.; New Zealand, 41s. to 43s.

Condensed Milk.—No alteration since last quotation.

Sugar (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £17 to £18 15s.; raw, £14 to £16 per ton; German beet, 88 per cent., 9s. 1d. per cwt.

Molasses (duty, 2s. per cwt. and ¼ per cent.).—4s. 6d. to 8s. 6d. per cwt.

RICE.—Rangoon, £7 to £12; Japan, £13 to £17; Java, £18 to £21; Patna, £16 to £18 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 43s. to 130s.; peaberry, 60s. to 120s.; Santos, 28s. to 46s.; Mocha, 60s. to to 90s.; Jamaica, 100s. to 125s. per cwt.

CHICORY ROOT, dried (duty paid).—26s. to 27s. per cwt.

ARROWROOT.—St. Vincent, 1¾d. to 3d.; Natal, 5¾d. to 7d.; Bermuda, 1s. 2d. to 1s. 5d. per lb.

WHEAT.—Duluth, 35s. 3d. per 496 lb.; English, 31s. per 504 lb.; Australian, 32s. per 496 lb.

FLOUR.—23s. 6d. to 29s. 6d. per 280 lb.

MALTING BARLEY.—24s. to 32s. per 448 lb.

OATS.—18s. to 20s. 6d. per 336 lb.; New Zealand, 22s. 6d. to 23s. 6d. per 384 lb.

SPLIT PEAS.—38s. 6d. per 504 lb.

GINGER.—Jamaica, 38s. to 57s.; Cochin, 34s. to 65s.; Japan, 22s. to 23s. per cwt.

VANILLA.—3s. to 12s. per lb.

PEPPER.—Capsicums, 14s. to 65s.; chillies, 45s. to 50s. per cwt.; black, 5¾d. to 6d.; white, 8¼d. to 9d. per lb.

GREEN FRUIT.—Apples: Nova Scotia, 14s. to 20s. per case; Australian, in large supply, 6s. to 7s. 6d.; Tasmanian, 5s. 6d. to 7s. 6d. to 10s. per case; bananas, 7s. to 13s. per bunch; pineapples, 2s. 9d. to 6s. each; oranges, Valencia, per 420, common, 7s. 6d. to 9s. 6d.; medium, 10s. to 11s. 6d.; fine selected, 17s. to 20s.; finest selected, 24s. to 32s.; lemons, Messina, per 360, finest selected, 14s. to 17s.; ordinary to fine, 6s. to 11s.

FRUIT PULP.—Gooseberry, 5s. 6d. to 6s. 6d.; apricot, 9s. to 15s.; raspberry, 19s. to 24s.; greengage, 8s.; plum, 6s. to 7s. 6d.; peach, 6s.; New Zealand, black currant, 38s. to 45s. per cwt.

DATES.—Tafilat, none; Egyptian, 11s. to 15s. per cwt.; Persian, 6s. to 9s. per case.

COTTON.—Uplands, from 6d. to 8d.; Sea Island, 1s. 2d. to 1s. 8d. per lb.

COTTON SEED.—£6 to £6 10s. per ton.

COTTON-SEED OIL.—Crude, £16 15s.; refined, £18 5s. to £20 5s. per ton.

COTTON-SEED OIL CAKE.—£4 15s. (undecorticated), £7 5s. (decorticated) per ton.

LINSEED.—29s. 6d. per quarter.

LINSEED OIL.—£13 15s. per ton.

LINSEED OIL CAKE.—£6 5s. to £6 15s. per ton.

OLIVE OIL.—£30 to £55 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 to £16 10s. per ton; £8 to £9 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£27 to £31 per ton.

BEESWAX.—Australian, £4 15s. to £7 15s. per cwt.

LUCERNE SEED.—60s. to 70s. per cwt.

CANARY SEED.—58s. to 80s. per quarter = 7s. 3d. to 10s. per bushel.

MANILLA HEMP.—£30 to £34 per ton.

SISAL HEMP.—£32 to £34 per ton. £32 to £35 in Melbourne market.

NEW ZEALAND HEMP.—£30 to £31 per ton.

FLAX.—£48 to £52 per ton.

TAPIOCA (duty, 5d. per cwt.).—2¾d. to 5d. per lb.

Frozen Meat.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.
(Crossbred Wethers and Maiden Ewes.)

	June 11.	June 18.
Canterbury, light (48 lb. to 56 lb.)	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{4}$d.	$4\frac{1}{4}$d.
Dunedin and Southland (56 lb. to 64 lb.)	$4\frac{3}{16}$d.	$4\frac{3}{16}$d.
North Island (56 lb. to 65 lb.), ordinary	4d.	4d.
North Island, best	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.

Australian Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	None offering.	
Light (under 50 lb.)	None offering.	

River Plate Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
Light (under 50 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.), new season's	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Canterbury, heavy (36 lb. to 42 lb.), new season's	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{3}{8}$d.	$5\frac{3}{8}$d.
North Island (28 lb. to 42 lb.) ...	$5\frac{1}{2}$d.	$5\frac{1}{2}$d.

Australian Lambs.

30 lb. to 40 lb.	None offering.	

River Plate Lambs.

30 lb. to 40 lb.	None offering.	

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	$2\frac{5}{16}$d.	$2\frac{5}{16}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{5}{8}$d.	$3\frac{5}{8}$d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	$2\frac{1}{4}$d.	$2\frac{1}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{1}{8}$d.	$3\frac{1}{8}$d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	$2\frac{1}{4}$d.	$2\frac{1}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.

Eggs.—French, 7s. to 9s.; Danish, 6s. 6d. to 7s. 10d. per 120.

Bacon.—Irish, 54s. to 65s.; American, 39s. to 40s.; Canadian, 40s. to 50s. per cwt.

Hams.—Irish, 74s. to 90s.; English, 78s. to 100s.; American, 45s. to 50s. per cwt.

Tallow.—Mutton, fine, 27s.; medium, 25s.; beef, fine, 25s. 6d.; medium, 24s. per cwt.

Goatskins.—Cape, from extra light to heavy, 9d. to $15\frac{1}{2}$d.; Angora, light to heavy, 5d. to $7\frac{1}{2}$d.; Natal, goat and Angora, $1\frac{3}{4}$d. to 8d. per lb.

Poultry (Smithfield).—Yorkshire, 3s. 3d. to 3s. 9d.; Essex, 2s. 9d. to 3s. 3d.; Boston, 2s. 6d. to 3s.; Surrey, 3s. to 5s.; Sussex, 3s. 6d. to 4s.; Welsh, 2s. 6d. to 3s.; Irish, 2s. 6d. to 2s. 9d. per pair; turkeys (cock) 8s. to 12s., (hen) 5s. to 6s.; goslings, 4s. 9d. to 5s.; country ducklings, 3s. 3d. to 6s.; Aylesbury, 5s. 6d. to 7s. per pair; rabbits, 9d. to 10d. each.

General Notes.

DESTRUCTION OF THE MUNGOOSE.

If we remember rightly, it was at one time proposed to introduce the snake-killing mungoose into Queensland for the purpose of destroying rats in the canefields. The proposal, fortunately, came to nothing. These animals were introduced into Barbados some years ago, and now an Act has just been passed by the Legislature of that island offering a reward of 3d. per head for the destruction of the mungoose, and providing a penalty not exceeding £5 to be imposed on any person who shall import or attempt to land a mungoose or head of a mungoose. Why the head should be an object of solicitude, we fail to understand.

PINEAPPLE WINE.

Over the peelings of two pineapples pour 1 quart of boiling water; allow it to steep until cold, then sweeten to taste, strain and bottle. Tie down the cork, and place the bottle on its side; if placed in a warm place, it will be ripe in twenty-four hours. A small piece of ginger placed in each bottle will improve the flavour. If made in large quantities, the whole pineapple chopped should be used.

NEW METHOD OF GROWING TURNIPS.

The *Journal of the Jamaica Agricultural Society* says:—Mr. G. S. Hudson, Agricultural Instructor at St. Lucia, writes: "When visiting the Rivière Doreé School Garden, I was much struck by a new method of growing turnips—viz., by cutting off the edible root and replanting the old heads and leaves, as with tannias, when a new turnip is formed." We might mention that similar results with radishes have been reported from a school garden in Castries.

HATCHING CHICKENS FROM PRESERVED EGGS.

We have frequently been asked if eggs preserved for any length of time in lime-water or water-glass would produce chickens if set or placed in the incubator. We do not know, for we never made the experiment or found a person who had tried it. Here, however, is a note from one of our exchanges, from which it would appear to be possible to get chickens from preserved eggs:—A Surrey poultry farmer (Mrs. Deare) writes that in April, 1902, she "put down a number of eggs in water-glass, and in April, 1903, twelve months later, one of these, put in an incubator, produced a healthy chick, which was photographed."

ACTION ABOUT A POTATO TRANSACTION.

We can scarcely imagine an expensive action being brought for non-delivery of 14 lb. of potatoes, yet this occurred at the Cupar Sheriff Court, Scotland, at the instance of a Lincolnshire farmer against Archibald Findlay, potato-grower, Mairsland, Fife, in which pursuer asked for delivery of 14 lb. of Eldorado potatoes alleged to have been purchased from the defender on or about 14th December, 1902, and, failing delivery within such time as the court shall appoint, payment of the sum of £2,000 as damages. The defence was a denial of the sale. At the hearing of the case a minute was lodged in which the defender agreed, in the event of the contract being held good, to deliver the potatoes.

The potatoes were of the new Eldorado variety, and had been sold to pursuer at 1 guinea per lb. Already heavy legal expenses have been incurred, and, as the case may again come on for hearing, the lawyers' fees will probably amount to something considerable.

POULTRY-KEEPING IN QUEENSLAND.

The *Farmer and Stockbreeder*, London, evidently appreciates the efforts of the Secretary for Agriculture to encourage the raising of poultry for eggs and export by the Queensland farmers. The following appears in a late issue of that journal:—

The Queensland Agricultural Department is attempting to develop the poultry industry among the farmers and amateur poultry-breeders in the State. An expert has been appointed as a lecturer to travel through the farming districts and visit the bush towns, to instruct his audiences in the art of keeping poultry and making profits out of them. Accompanied by a lantern operator, and supplied with a fine set of illustrations, he is touring the country and giving a large amount of information. Poultry-farmers in Queensland are fortunate in having the Government to look after their interests in this way.

A GOOD MANGO.

The Aphonso mango, of Bombay, grown upon grafted trees, is the most delicious fruit known to man. It has the flavour of the ripe peach, apple, and pear combined. The season opens in May and June, and the first of the fruit to ripen sells readily at 5s. a dozen. In England the fruit sells at 12s. to 18s. a dozen.—*Farm and Fireside.*

TO PREVENT HORSES BOLTING.

It is said that no horse in a Russian city ever bolts. The Russian driver knows that a horse requires free play of his windpipe and lungs to do a run. Hence a light, strong rope is placed round his neck with a running noose. Should the animal attempt to run away, the driver tightens the rope. The horse begins to be strangled and stops merely from want of breath. This is also worth a trial.

CURE FOR A JIBBING HORSE.

The success of the method here given of curing a horse of jibbing depends upon the correctness of the statement given in the *Indiana Farmer* that "no horse ever refuses to pull by his tail." If that be so, then the method is all right, and has the merit of being a very humane one. "Take a small rope, and firmly attach it to the horse's tail. Take a turn on the double tree or cross-bar, giving slack enough to tighten the traces. If the horse refuses to pull, tighten this rope till the draft comes on the tail. No horse ever refuses to pull by his tail. When the horse starts, the tail-hold may be relaxed till the draft comes on the traces again. Many jibbing horses will refuse to start; others will start off, but if stopped will refuse to pull. The way to treat this form of vice is, as stated, to pull on the tail rope. Then he will go. Persist in this treatment, and a permanent reformation is sure to result."

RABBIT-SKIN TRAPS.

Some time back a correspondent asked for a means to prevent ants from climbing trees. During 1889 and 1900 ants were very bad on the river, and I noticed a cheap and effective plan tried on some young fruit trees and sugar gums, viz.:—Tie a rabbit skin (upside down, tail up the tree), fur outwards, tight around the stem. The ants start to climb up the fur, and as they reach the end of each single hair, the hair drops and lets them down. I spent some time (as I was a boy in those days) watching the performance, and always with the same result; the ants gave it up as a bad job. The skin must be upside down, or the ants can climb up. I suggested the plan to some Gumeracha friends as a mean of preventing the codlin grubs from climbing the trees, but I believe the bandages are for catching the grub. How would the fur inwards do: it ought to make a warm camp for them? I first saw "bunny" so used at the homestead of Mr. J. G. Preiss, of Mannum, one of the most progressive farmers on the flat.—*Exchange.*

EXPORT OF COTTON AND COTTON SEED FROM EGYPT.

According to the "Consular Report on the Trade of Alexandria" for 1902, the exports of cotton were 6,621,608 kantars (about 292,651 tons); this is 16 per cent. more in quantity and 23 per cent. more in value than the average for the four preceding years. The exports of cotton seed amounted to 17,540,515 bushels—9 per cent. less in quantity, but 8 per cent. more in value.

Answers to Correspondents.

ANGORA GOATS FOR SALE.

MOHAIR, North Coast Line.—Apply to Mr. H. Missing, Talegalla, Tiaro. He has a large flock of Angoras, and would probably be able to meet your requirements. We may also mention that the Department of Agriculture of Western Australia has now for private sale the first annual draft of Angoras. These animals are all purebred, and of high quality in the fleeces. The prices are:—For full-mouthed bucks, £2 2s.; young bucks up to 6-tooth, £3 3s.; does, £5 5s.

APPLYING LIQUID MANURE.

AMATEUR GARDENER, Milton.—It is no wonder that your pot plants do not survive your careful (?) treatment. In the first place, they should not receive liquid manure every day; secondly, the manure should not be too strong. It should be remembered that pot plants, in the limited space available for the roots, have not the power of rejecting food brought in contact with the latter in the shape of liquid manure, therefore take it they must, and the ill-effects are only seen after the mischief is done. The slower growth a plant makes naturally the less able it is to bear manure water in a strong state. Cowshed water should be diluted at the rate of 2 gallons of water per pint. A good way to collect the valuable constituents of the cowshed is to soak pieces of charcoal in it, or even sawdust. These absorb it, and it is thus easily removed. One half-bushel of soot in a bag immersed in 600 gallons of water makes a splendid stimulant, but quickly becomes exhausted.

A simple and cleanly way of applying liquid manure to pot plants is to soak charcoal in a strong solution. Then take it out and dry it. When repotting the plants, put a little of this in the bottom of the pot. When the roots of the plant reach it, the effect will soon be visible. Finally, never apply liquid manure to pot plants without first watering with clean water.

The most simple, best, and easiest procured form of liquid manure is this: Take a kerosene tin full of fresh horse or cow manure (the latter preferred), put it (the manure) in a bran bag, and suspend it in a barrel containing 30 gallons of water. Keep this stirred frequently for a week, and let it settle. When clear, use 1 quart of the liquid diluted with 2 gallons of water.

WORMS IN HORSES.

H. ANDRESEN, Yandina.—Give the horses the following as directed:—

Oil of turpentine	2 to 4 oz.
Raw linseed oil	1 pint.

Mix, and give as a drench in the morning once a week until four doses have been given. Great care must be exercised in drenching horses with oil. If the animal coughs whilst the drench is being given, *drop the head immediately*, for if any of the fluid goes down the windpipe it will very probably cause inflammation of the lungs. Rock salt in the manger where the horses feed will be beneficial.

THE ISIS AND BROOKFIELD DISTRICTS.

Additional information and several illustrations having reached us too late for publication, the description of the above districts is held over for the next issue of the *Journal*.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JUNE. Prices.
Apples, Eating, per packer	6s. to 7s.
Apples, Cooking, per case	5s. 6d. to 6s.
Apples, Tasmanian, Cooking, per case	...
Apples, American, Eating	...
Apples, American, Green	...
Lemons, Italian, per 360	...
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Lemons, New South Wales, per case	3s. 6d. to 4s.
Oranges, Italian, per 180	...
Oranges, Local, per case	2s. to 2s 6d.
Oranges, Sydney (packers)	...
Mandarins, Local, per case	3s. to 3s. 6d.
Mandarins, Bowen	...
Apricots, New South Wales, boxes (half-gincase)	...
Apricots, Queensland, half-case	...
Plums, half-gincase	...
Plums, Sydney, half-gincase	...
Peaches, half-gincase	...
Nectarines, half-gincase	...
Gooseberries, English	...
Cherries	...
Passion Fruit, quarter-case	2s. 9d. to 3s. 3d.
Mangoes, per case	...
Pineapples, rough, per dozen	10d. to 1s.
Pineapples, Queen ,,	3s. to 3s. 6d.
Melons	...
Rockmelons	...
Bananas, per bunch	5d. to 6d.
Bananas, per dozen	$1\frac{1}{2}$d. to $1\frac{3}{4}$d.
Tomatoes, quarter-case	2s. to 2s. 6d.
Papaw Apples, quarter-case	...
Custard Apples, quarter-case	2s. 6d. to 3s.
Granadillas, case	...
Seville Oranges, apple-case	2s. to 2s. 6d.
Cape Gooseberries, quart	5d.
Pears (Melbourne), export case	...
Pears (Tasmanian), quarter-case	3s. to 3s. 6d.
Rosellas, per sugar-bag	1s. 3d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JUNE.

Article.		JUNE. Prices.
Bacon	lb.	6d. to 7d.
Barley, Malting	bush.	2s. 9d. to 3s. 3d.
Bran	ton	£2 10s. to £2 15s.
Butter, Factory	lb.	$7\frac{1}{2}$d. to $8\frac{1}{4}$d.
Chaff, Mixed	ton	£2 5s. to £3

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JUNE—*continued.*

Article.		JUNE. Prices.
Chaff, Oaten	ton	£2 10s. to £3 15s.
Chaff, Lucerne	„	£2 to £2 17s. 6d.
Chaff, Wheaten	„	£2
Cheese	lb.	4½d. to 6d.
Flour	ton	£7 5s. to £7 15s.
Hay, Oaten	„	£4 17s. to £5
Hay, Lucerne	„	£1 5s. to £2
Honey	lb.	1¾d. to 2d.
Maize	bush.	1s. 6d. to 1s. 9d.
Oats	„	2s. to 3s. 6d.
Pollard	ton	£2 10s. to £3
Potatoes	„	£2 to £3 15s.
Potatoes, Sweet	„	£1 5s. to £1 15s.
Pumpkins	„	11s. 8d. to £1 11s. 8d.
Wheat, Milling	bush.	2s. 9d. to 3s. 6d.
Wheat, Chick	„	1s. 8d. to 2s. 6d.
Onions	ton	£3 2s. 6d. to £3 15s.
Hams	lb.	9½d. to 10½d.
Eggs	doz.	1s. to 1s. 3d.
Fowls	pair	1s. 6d. to 3s. 7d.
Geese	„	4s. 6d. to 6s.
Ducks, English	„	2s. 3d. to 3s. 7d.
Ducks, Muscovy	„	2s. 6d. to 4s. 3d.
Turkeys, Hens	„	5s. to 8s.
Turkeys, Gobblers	„	7s. to 12s.

ENOGGERA SALES.

Animal.	MAY. Prices.
Bullocks	£8 10s. to £9 12s. 6d.
Cows	£5 12s. 6d. to £6 15s.
Wethers, Merino	22s. 9d.
Wethers, C.B.	23s. 9d.
Lambs	17s. 6d.
Baconers	47s. 6d.
Porkers	31s.

Orchard Notes for July.

By ALBERT H. BENSON.

The remarks that have appeared in the Orchard Notes for the last three months anent the handling, packing, and marketing of citrus fruits apply equally to the present month.

The pruning of all kinds of deciduous fruit trees should be completed during the month. All prunings should be gathered and burnt, and the tree should then receive a thorough spraying with the lime, sulphur, and salt wash, which is the best all-round winter spray, acting both as an insecticide and a fungicide. After pruning and spraying, the orchard should be well ploughed, so as to bury all weeds and trash that may have accumulated, to sweeten the soil, and to break up any pan that may have been formed by summer cultivation.

Citrus trees, from which the fruit has been gathered, should be pruned now, the pruning to consist of cutting out all dead branches or branches having borers in them, as well as all branches, thorns, or twigs growing in the centre of the tree which are not required. The centre of the tree must be kept well opened up, as, unless this is done, the superfluous wood only forms a harbour for all kinds of insect and fungus pests, and, in addition to this, where the tree is not well pruned out in the centre, it is impossible to do good work with the spray pump.

As already stated, all the prunings from the tree should be gathered and burnt, as this is the surest way of destroying any scale insects, borers, or fungus pests with which they may be infested. If you have no spray pump, then the above mixture should be applied with a brush. It will destroy all scale insects with which it comes in contact, and will remove all moss and lichen as well as stop the spread of canker or bark rot.

The planting of deciduous trees can be continued throughout the month, but it is not advisable to delay it more than can be helped, as when the trees are planted, even though they make no leaf or wood growth, they begin to throw out adventitious rootlets which are ready to start work as soon as the first top growth takes place. Don't plant too deep: the depth at which the young trees stood in the nursery is the right depth; trim the roots carefully, so as to remove all bruised portions; spread the roots out well, so that they may get a good hold of the ground, and always spread a little fine top soil round them, as this will be conducive to the rapid formation of new roots.

Cut back hard at planting, and don't be afraid that you will spoil your tree by doing so. Failure to cut hard back prevents the formation of a strong, well-grown, symmetrical tree, and always tends to injure the future vigour and growth of the tree.

See that all trees that are planted, whether deciduous or evergreen, are free from pests, as it is much easier to keep disease out of the orchard by planting clean trees than it is to stamp out disease once it has got a fair hold. Where the trees are infested with scale insects of any kind, they should be treated by hydrocyanic acid gas, as recommended and described from time to time in this *Journal*. If this treatment of the young trees is carefully carried out, there is every chance of their remaining clean for a considerable time after they are planted.

Do not plant rubbish; only plant those trees that your soil and climate are adapted for. Do not try to grow fruits that will only end in failure, as no grower who is dependent on fruit culture for his living can afford to grow fruits that can be produced both better and cheaper by others under more suitable conditions; but he must confine his energies to the culture of those fruits that prove a commercial success.

It costs just as much to prepare the land for and to plant, prune, spray, manure, cyanide, and generally look after an inferior variety of fruit tree, or a variety of fruit tree that is unsuitable to the climate, and from which no return of any value can ever be obtained, as it does to grow a variety that is suitable to the soil and climate, that will produce superior fruit, and for which there is always a ready sale. Therefore, I again repeat that no grower who is dependent on fruit culture for his living can afford to spend time or money in the growing and looking after unsuitable varieties of fruit trees.

Farm and Garden Notes for August.

Farm.—Now is the time for busy work in the field, work which will produce rich results at harvest time. Clean the crops put in last month. Sow maize for an early crop. Get the potatoes planted as soon as possible, and only plant such as have sprouted. By doing this you get an evener and more certain crop than if the unshot seed is planted. In choosing maize for seed, select the large, well-filled, flat grains. It has been shown that by constantly selecting seed from prolific plants, as many as five or six cobs of maize can be produced on each stalk all over a field. Sow pumpkins, either amongst the maize or separately if you have the ground to spare. Swede turnips, clover, and lucerne may still be sown, but they will have to contend with weeds which will begin vigorously to assert themselves as the weather gets warmer. Therefore, keep the hoe and cultivator regularly going. Plant arrowroot, ginger, and sugar-cane. During this month tobacco may be sown. If vines are available, sweet potatoes may be planted towards the end of the month. If grasses have not yet been sown, it should be done at once. Sugar-cane crushing in the tropical parts of the State will be in full swing this month. Should frost injure the cane in the Southern parts, it should be put through the rollers at once. Rice and coffee should be already harvested; but the picking of Liberian coffee begins this month. Plough out old canes and prepare the land for replanting.

In the North, collect Divi-divi pods. Orange-trees will be in blossom, and coffee-trees will be in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—There is plenty of work to be done now in the vegetable garden, especially in destroying the aphis-infested plants. All spring and summer crops can be put in. Sow carrots, parsley, beet, lettuce, French beans, runner beans of all kinds, peas, parsnips, tomatoes, squashes, cucumber, melons, pumpkins, sweet corn, egg-plant, mustard and cress, cabbage, sea-kale, kohl-rabi, radish, &c. Plant out rhubarb, horse-radish, herbs, sea-kale, asparagus, ginger, Jerusalem artichoke, and any cabbage plants which may be ready. Get all the potatoes planted as soon as possible. Attend to the thinning of such crops as require it, such as carrots, turnips, parsnips, &c. Peas should be supported by sticks or wire netting. Globe artichoke may be planted. Keep the weeds down by a free use of the hoe and cultivator. As the cabbage and cauliflower beds become finished, plough or dig them up, and, if possible, allow the soil to be exposed to the air for a month or two before putting another

crop in it. Pinch tops off broad beans when they come into flower, to make the fruit set. Give plenty of water to all vegetables, especially to cabbages during the dry weather.

Flower Garden.—Ferneries will require overhauling, and topdressing with a mixture of sandy loam; some plants will require staking, others thinning out. The roses will have already been pruned, but look at them occasionally, and help them by rubbing off here and there a shoot with a tendency to grow in and crowd the centre of the bush. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Dahlias would be more advantaged by placing them in some warm, moist spot, when they would start gently, and be ready for planting out a month or two later.

Times of Sunrise and Sunset, 1904.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·11	6·16	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

Phases of the Moon.

			H. M.
7 May	☾	Last Quarter	9 50 p.m.
15 ,,	●	New Moon	8 58 ,,
22 ,,	☽	First Quarter	8 18 ,,
29 ,,	○	Full Moon	6 54 ,,
6 June	☾	Last Quarter	3 52 p.m.
14 ,,	●	New Moon	7 10 a.m.
21 ,,	☽	First Quarter	1 10 ,,
28 ,,	○	Full Moon	6 23 ,,
6 July	☾	Last Quarter	8 54 a.m.
13 ,,	●	New Moon	3 27 p.m.
20 ,,	☽	First Quarter	6 48 a.m.
27 ,,	○	Full Moon	7 41 p.m.
4 Aug	☾	Last Quarter	12 2 p.m.
11 ,,	●	New Moon	10 58 ,,
18 ,,	☽	First Quarter	2 27 ,,
26 ,,	○	Full Moon	11 2 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1904.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May ...	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June ...	1 m.	19 m.	10 m.	44 m.	7 m.	53 m.
July ...	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August ..	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

CUSTOMS UNION OF SOUTH AFRICA.

IMPORT DUTIES ON PRODUCE THAT CAN BE EXPORTED FROM QUEENSLAND.

Article.	Rate.	Per
Agricultural Implements	free	...
Arrowroot	£10	£100
Bacon and Hams	1d.	lb.
Barley and Maize	1s.	100 lb.
Bark	£10	£100
Beef	1d.	lb.
Binding Twine	free	...
Bone Dust	free	...
Bran	£10	£100
Butter	2d.	lb.
Canary Seed	£10	£100
Cattle for Slaughter	£1 10s.	each
Cheese	£10	£100
Chicory Root (dried)	2d.	lb.
Coffee (raw)	$\frac{3}{4}$d.	lb.
Coffee (roasted or ground)	2d.	lb.
Condensed Milk	$\frac{1}{2}$d.	lb.
Compressed Fodder	1s.	100 lb.
Cotton (raw)	free	...
Cured Fish	1d.	lb.
Desiccated Milk	$\frac{1}{2}$d.	lb.
Eggs	£10	£100
Fertilisers	free	...
Fibres	free	...
Flax	free	...
Flour	2s.	£100
Fruit Preserved in Spirits—		
Duty on the Spirits	15s.	Imperial gallon
And in addition	£10	£100
Duty on the Fruit	2d.	lb.
Fruit (green)	free	...
Fruit (pulp)	2d.	lb.
Fruit Wines, 3 per cent.	£10	£100
Ginger (green)	£10	£100
Ginger (dry or ground)	2d.	lb.
Hemp (raw)	free	...
Jams, Jellies, &c.	2d.	lb.
Jute	free	...
Lucerne Hay	1s.	100 lb.
Malt	1s.	100 lb.
Milk (condensed)	$\frac{1}{2}$d.	lb.
Mules	free	...
Meats	1d.	lb.
Maize	1s.	100 lb.
Oaten Hay	1s.	100 lb.
Oil Cake	1s.	100 lb.
Onions	$\frac{1}{2}$d.	lb.
Paddy	2d.	lb.
Pickles	2d.	lb.
Pollard	2s.	100 lb.
Potatoes	£10	£100
Railway Sleepers	£2 10s.	£100
Rice	£10	£100
Seeds for Sowing	free	...
Sheep	5s.	each
Smoked Fish	1d.	lb.
Spices	2d.	lb.
Sparkling Wines—		
Not exceeding 20 per cent. proof spirit	12s. 6d.	Imperial gallon
And in addition	£10	£100
Still Wines—		
Not exceeding 20 per cent. proof spirit	4s.	Imperial gallon
Exceeding 20 per cent., but under 50 per cent. proof spirit	8s.	Imperial gallon
Sugar (unrefined)	3s. 6d.	100 lb.
Sugar (refined)	5s.	100 lb.
Tannin Extracts	free	...
Tobacco Leaf (stemmed)	2s. 6d.	lb.
Tobacco Leaf (unstemmed)	2s.	lb.
Treacle	3s. 6d.	100 lb.
Vegetables (pickled, pressed, or preserved)	£10	£100
Wheat	1s.	100 lb.
Wheaten Hay	1s.	100 lb.

Agriculture.

POTATO PLANTING.

The lecture on potato culture recently delivered by Mr. Wallace to the East Lothian Farmers' Club contained two leading features which have received considerable attention since, and, indeed, one of them has excited controversy. Mr. Wallace stated that a system had grown into rapid favour in Scotland of early harvesting for the tubers intended to be planted the following year. They were taken up in July, when the tops were perfectly green, and when in the worst of seasons it was too early for them to have become spotted by disease. The tubers had not then attained to mature growth, but they were considered to be best for planting by a very large majority of the Fife farmers. No sooner had this been propounded than an old stockbreeder and agriculturist pronounced it to be decidedly wrong, on the ground that it has always been acknowledged to be a sound physiological principle in the vegetable as well as in the animal kingdom to propagate from mature stock or seed. Mr. Wallace has replied to this, that the tuber is not the seed of the potato; and that growing from tubers is akin to fruit-culture by grafting.

To the practical grower it does not so much matter who is right and who wrong as to the principle of things, if disease can be escaped from, or even lessened, by selecting immature tubers for setting, before the plants that grew them had become spotted. Let us turn, then, to the other important feature in the lecture, that of the utility of "boxing" propagation-tubers, for transference of the plants thereby raised by protection to the open, only at a period after all danger of frost destruction by night exposure has passed. Mr. Wallace stated that he adopts this system, not merely for his early crops, but with a still greater preference for his main one, as it obviates the enormous labour of pulling about sticky land in early spring, when unfit to undergo tillage. This he deemed an incalculable advantage, and he had always found the transferred plants as early in May, as those from the planting of tubers into the open ground two months earlier. He stated, moreover, that he was certain that he had increased his yield of crop fully 3 tons per acre, by adopting the boxing system.

In regard to ordinary tillage cultivation, now so rife for the main crop, it is indisputable that land intended to bear a good yield can scarcely be brought to too fine a tilth. The rootlets will spread with greater rapidity and be enabled to take up their nutriment better if the soil is well pulverised. Anyone can be perfectly convinced of the truth of this by simply observing how readily, when fine growing weather comes, potatoes in ground which has received good management respond to every touch of Nature; while in soils worse prepared they are slow to exhibit the slightest sensibility to stimulating influences.

The field planting of tubers for the main crop can be effected in several ways. There are the old-time ones of dibbling by line or striking out drills or trenches to set the tubers in with a mattock; the far more general one, in these times of manual labour scarcity, of trenching the land with a plough for setting the tubers in; or of the still simpler one of setting them into every third furrow, in the last ploughing. But many of the large Scotch growers save human hands in the setting. Their potato-planting machines, drawn by horses, make drills by coulters for the tubers to fall into just as corn drills do; a revolving spindle with spikes takes the place of the revolving spoons of the corn drill, each spike, as it passes into the box containing the sets, being supposed to stick itself into a tuber and carry it over and drop it

into the coulter. If perchance one was not taken up, there would be a miss or vacancy in the planting—the only apparent evil; but with an efficient well-adjusted machine there are not enough misses to hinder large growers from availing themselves of a machine which saves so much manual labour.—*Mark Lane Express.*

AGRICULTURE AND THE BRITISH FISCAL POLICY.

Addressing a meeting of the Leicestershire Chamber of Agriculture, at Leicester, Mr. Jesse Collings, M.P., said: If we had purchased commercial supremacy at the price of the ruin of agriculture, we had purchased that supremacy at a ruinous price. Cobden's prediction as to free trade increasing the cultivation of the land had been falsified, and the population had gone more and more to the towns. At the last census it was shown that 77 per cent. of the population in England and Wales was urban. That state of things could not go on. What was the remedy? Mr. Chamberlain's proposals were something. They included a 2s. tax on imported grain and a small tax on other agricultural articles. He would also regard flour, of which 1,000,000 tons were imported last year, as a manufactured article. The price of bread would be the same, only the grinding would be done in this country instead of abroad, which would be to the advantage of the farmer in the matter of bran and offals. The farmer could not be helped by what was called protection. If they helped him substantially they must put a heavy sum towards his production of the grain, and nothing less than 5s. or 10s. per quarter would give him prosperity. The history of agriculture, however, showed that the moment the farmer was helped it meant his rent being increased. The landowner was the master of the position, and they could not help the farmer so long as he was a tenant. His remedy was in his Bill, which he was to reintroduce this year, and which he had modified on the lines of the Irish Land Bill. This provided an opportunity for the farmer to purchase his land by means of a loan from the State, repayment to be made at $2\frac{3}{4}$ per cent. interest, with an addition of 10s. per cent. for sinking fund, making altogether $3\frac{1}{4}$ per cent. to be paid annually. The best of it was that the annual instalment of $3\frac{1}{4}$ per cent. would be in most cases much less than the rent now paid. That sounded like juggling, but the secret of it was the loan on the credit

LINSEED AS A ROTATION.

A valuable feature of flax culture is its use as a rotation (says the *Australasian*). While the growth of flax for fibre is attended with certain difficulties, the simpler form of flax culture for linseed should not be neglected, taking into account its value as a food in dairying, and also in connection with wheat-growing. Grown in alternation with wheat, the effects are strikingly beneficial. One reason for this is doubtless the fact that a crop of linseed takes up a different set of soil constituents for its nourishment to that which cereals require. The effects upon a following crop of wheat would suggest that linseed exercises a positively fertilising influence. This effect is well known to some of the oldest wheat-growers of South Australia in a portion of that State at one time famous for flax-growing, and these growers for many years resorted most successfully to the expedient of growing a crop of linseed as a rotation with wheat. "We can always depend upon a good crop of wheat after linseed," a South Australian farmer remarked to our agricultural reporter during one of his visits to that State, and the remark induced a Victorian wheat-grower to try an experiment several years ago on a portion of his wheat land which had become "grain sick," with the result that his experiment proved the crop to be peculiarly suitable to the districts north of the Dividing Range, so far as the

production of linseed is concerned, although the length of stem required for a crop of fibre needs for its production considerably more care. If sown during April or early in May, at the rate of about a bushel of seed to the acre, it is ready for harvesting in October, before the hay or grain harvest sets in, and it stands the heat better than either oats or wheat. An ordinary yield is from 15 to 20 bushels per acre, and it can be harvested and thrashed in the same manner as wheat. Taking into account the value of linseed as a food in connection with our rapidly extending dairying industry, linseed is deserving of more attention when its merits as a wheat rotation are proven in addition.—*Australasian.*

TAN BARK.

At the beginning of the year we noted that a South Australian firm addressed a letter to the Minister for Agriculture of Natal, South Africa, to the effect that they were "desirous of importing some Natal mimosa (or wattle) bark for tanning purposes." This appeared to us to savour much of carrying coals to Newcastle. South Australia is largely engaged in the wattle-growing business, and the bark has always held a high place in the market for tanning material. About ten years ago prices became greatly reduced, and the bark industry was greatly depressed, but values have recovered of late, and greater activity has been apparent, employment being given to numbers of strippers, and considerable sums have been added to farmers' incomes. Successful plantations have been formed, and several additional steam-grinding plants have been erected, giving employment to many hands. Last year, 1903, 8,566 tons of bark were stripped. In 1902, 7,702 tons, valued at £68,850, were exported. It thus seems strange that, whilst so large a quantity of bark is exported, there should be a movement for importing bark from South Africa.

We are, however, only concerned here with the bark industry, as it affects this State. It is a misnomer to allude to the little work done in Queensland wattle bark stripping as an industry. If people would but realise the fact that there is no State of the Commonwealth more favourable to the growth of the wattle-tree, nor any State where it is found in greater profusion, then, perhaps, plantations would be formed, and the natural growth now neglected would be largely exploited. We have often pointed out the great value of mangrove bark as a tannin material, and have published analyses made by Mr. J. C. Brünnich, Chemist to the Department of Agriculture. These were all unheeded, until lately a stranger appeared on the scene and promptly raised the stripping and preparing for export of mangrove bark to the position of an industry. Now, we are regretting our supineness in this matter. Are we awaiting the arrival of some foreigner to show us how wattle-growing and stripping may become an industry? We have before us a very interesting letter from Mr. John Cauper, of Tiaro, on the cultivation of the wattle and the utilisation of the brigalow and black and silver wattle, which cover many thousands of square miles of our Western country, and which will soon be unapproachable owing to the rapid spread of the prickly-pear pest.

"In brigalow," says Mr. Cauper, "we have a gigantic asset (by its bark for extract purposes), which would give employment to thousands of people in Queensland alone." He points out that the brigalow scrubs are usually flanked by enormous tracts of very poor, sandy country which the agriculturist will not touch. Such land is originally the home of the wattles, many rich in tannin.

South Australia is cultivating these to good profit, and one may well ask why the barren lands of the interior of Queensland should not be put to like use. Population productive of weighty export staples, can alone make our railways pay, and "lift our stickfast or decaying townships out of their present stagnation, and lead the wheat farmer, with the endless failures due to climatic influences, into more profitable channels, such as are benefited by the climate.

The wattle crop has to be waited for from three to five years, and then brings in a lump sum at once. Could not the people settled on the railway lines be operating on the brigalow, and reclaim the brigalow country, and so keep the pot boiling till a "culture-raised bark crop comes in?"

Mr. Cauper says rightly that, in recommending brigalow bark, he must not be understood as placing it in line with silver and green wattle for its tannin contents, but as it contains 14 per cent. of tannin it may well vie with the European oak bark, which latter is only credited with 10 per cent. of tannin.

Mr. Cauper also says that we must get rid of the antiquated idea of sending away bark in bulk. In the South Australian wattle-growing districts there are numbers of bark mills, and the product is sent to Europe in a triturated state ready for maceration. It would pay still better to extract the tannin and export the liquid or dry extract.

In a second letter, Mr. Cauper deals with the practical methods to be adopted in connection with this industry, and with what we in Queensland have to learn as regards soils, seed, preparation of seed for sowing, time and method of sowing, and after-cultivation. In addition to these must be studied the mode of preparation for market, average yields per acre, and value in foreign markets.

Moreton, Stradbroke, and Glebe Islands are mentioned as being especially suited to wattle-growing.

For extracting the tannin, the necessary plant would consist of an eight to ten horsepower engine and boiler for crushing purposes and for steam heating in the process of extraction. Four wooden vessels of 2,000 gallons capacity each would be required. Iron should on no account be used. These wooden vessels could be protected by a light coating of water-glass and sand. The water must be soft and free from any iron or alkaline salts. The out-of-date Bauer and Wetzel pans, once used for the concentration of sugar-cane juice, would be adapted for a like purpose in connection with the tan extract.

We have just been informed by Mr. Thompson, superintendent of the Aboriginal Mission Station on Baramba Creek, that he had a quantity of wattle bark stripped and chopped small by the natives. This was sent to Brisbane and sold. The profit was £5. How much was sold we cannot say, but Mr. Thompson said it was a small lot.

There can be no question that, if this State is to thrive in respect to its exports, attention will have to be given to the production of articles which have more than a mere local value. There are foreign markets crying aloud for numerous products, which it is in our power to provide, but which can only be produced by getting out of one groove, and by ceasing to declare that a thing will not pay before it has been tried. We hear men say that it is too long to wait three or four years for a crop of wattle bark, or sisal hemp, or ginseng, or for many other slow-growing plants. But we hear very few talking about the length of time which must elapse before a crop of oranges, apples, pears, custard apples, mangoes, and other fruits can be obtained. The majority of farmers put in a few of these fruit trees, whilst at the same time they carry on their ordinary farm or dairy business. In like manner should they put in an acre or two of sisal, cotton, wattle-trees, and even of slower-growing timber. The years quickly slip by, and the reward is certain.

SOME MORE PIECES OF AMERICAN "GOOD ROADS" WISDOM.

By the Hon. A. J. Thynne, M.L.C.

The main object to be accomplished is to let the people see what modern good roads really are, how easily they can be built and kept in repair, and how durable they must be when built in a scientific manner with improved machinery handled by men who are experts in the business, having devoted to their profession years of study.—Hon. D. C. Heyward, at Greenville, South Carolina.

We regard good roads as next in importance to our great duty in training the minds and hearts of the young.—Senator Dean, South Carolina.

Once let the farmers get thoroughly interested in good roads, once let them have their eyes opened to what can be accomplished in that line, and the money necessary for the work will be forthcoming; you can depend upon that.

It is useless to argue the question that good roads are advantageous, for everyone realises and admits that they are, the farmer as readily as anyone else. He knows that they pay. He can make the calculation for himself. All you have to do is to arouse his interest and demonstrate to him what can be done by modern machinery and improved implements. He knows that a slight increase in his tax will be returned to him tenfold in the advantages that a good system of country roads will afford him. He knows that it will benefit him financially. He can market his crop in half the time, and at less than half the expense. He knows that it will benefit his family intellectually, for he can let his children attend the public schools in the neighbourhood with much greater convenience and regularity, and, perhaps, can send them to the graded schools of the town, and still keep them under the influence of home. He knows that it will benefit him socially by allowing him to mingle with the outside world and keep more in touch with his fellow-men. And he knows, lastly, that it will benefit him religiously, for over a good smooth road he will go more frequently to the sanctuary, and not have all of the little religion he has jolted out of him before he gets there.—D. C. Heyward.

The tendency of the present age is toward the use of machinery wherever possible; and in the improvement of highways of every kind, the use of ditching and roadmaking machines and of heavy road-rollers is of the first importance if economy and efficiency are to go hand in hand. The use of proper apparatus for the shaping up of the roadbed and the subsequent hardening of the surface is of paramount importance, and every supervisor of public roads should have at his disposal, at least during a part of each year, the machinery above referred to.

In the outlying country districts it is essential that the materials which are to enter into the making of a road shall be close at hand and easily accessible, and each section must work out the problem of improved highways with such sand, clay, or rock as may predominate in that section.

Throughout the lower and middle tier of counties of this State (South Carolina), sand and clay are almost always to be found within available distance of each other; and the application of sand to a clay surface or of clay to a sandy surface will invariably produce good results, if the mixture of the clay and sand is in proper proportions and the mechanical work of draining, shaping, and surfacing (including rolling) is carried out in a reasonably thorough manner.

It is a comparatively simple matter to take care of the surface water on a farm or neighbourhood road, and, with a road machine, several hundred feet of good roadbed suitable for neighbourhood traffic can be shaped in a day of ten hours. If the road is suitably crowned, so as to shed water into the ditches, and the surface is compacted with a heavy roller, a useful neighbourhood road can be produced at wonderfully small cost.

On a dirt road of this character a wide tire will consolidate the surface and steadily improve the road, reducing the cost of maintenance to a minimum. If, however, narrow-tired vehicles are driven over a dirt road the roadbed will be cut up in a short time, the water will lie in the ruts made by the wheels, and the labour expended on the road will be practically thrown away. . . . .

The method of making dirt roads may be summed up as follows:— Clear the road of all roots and vegetable matter; drain all damp places; provide for the rapid removal of surface water; compact the soil before putting on the clay or sand topdressing, as the case may be; mix the sand and clay thoroughly; roll the surface to a hard, even bearing; and last, but not least, keep on improving the roadbed by using broad-tired vehicles.

In considering the building of roads in rural districts, the matter of low first cost must always be kept in view. While this may appear somewhat high on account of the purchase of machinery, if several townships join in the purchase of the required outfit, the cost to each will be hardly felt, and the results obtained will fully justify the investment. The day cannot be far distant when the present system of "working roads" will be a thing of the past, and the road engineer with suitable appliances for the economical building of roads will become a recognised factor in the improvement of intercommunication throughout the country districts.

Passing now from the clay and sand roadbed of the small local and township roads, we come to the more important country roads which run to the railroad station, the town, or the city. Here the necessity of providing a better roadbed becomes evident, and the use of a harder and more durable material than sand and clay becomes important.

The rockcrusher is now brought into play, and is added to the road-building outfit. The roadbed must be broader, must be ditched, and, when thoroughly compacted, must be covered with layers of gravel or of crushed and screened rock. The drainage of the subsoil should be properly provided for. During my residence in France I had the opportunity of examining the magnificent stone roadbed of the French engineers, who are considered to be among the most expert roadbuilders in the world. The proper grading and the foundation work of their roads are always considered of paramount importance, and the mechanical work of sizing the material and compacting it upon the roadbed is often considered to be of more importance than its quality, as the material for topdressing is generally taken from the immediate vicinity of the roads, and necessarily varies much in quality. Quite as much care and attention is given by the French engineers to the maintenance of their roads after they are completed as is given to their construction.

The work of building stone roads should always be placed in the hands of competent roadmasters, who should carry on the work under the guidance of engineers of known ability.—E. L. Tessier, jr., Charleston, South Carolina.

FARM LABOUR IN THE UNITED STATES.

The wages of farm labour in the United States formed the subject of an inquiry conducted by the Department of Agriculture in 1902, in continuation of similar investigations which have been conducted from time to time since the year 1866.

The total number of agricultural labourers in the United States, according to the census of 1900, was 4,410,910, of whom 2,366,149 were members of the families of the farmers, leaving only 2,044,761 persons hired on farms outside the farm families, or less than one hired labourer for every alternate farm. The greater number of farmers in this country, therefore, do their own work with the aid of their families, with occasional assistance from neighbours. The tendency to special kinds of work and the disposition to do work by the job or piece, however, are evidently on the increase, and every year it becomes more difficult to give any correct view of farm wages in the form of tables. Ploughing and hoeing by the acre, gathering fruits, digging root crops, picking or husking maize, and threshing grain by measure, cutting by the shock and harvesting by the acre, are increasing practices, which involve great activity at their respective periods. but leave long intervals unoccupied.

The monthly wages of farm labourers engaged for the year or season, without board, averaged for the country, as a whole, £4 12s. 3d. in 1902, as against £4 4s. 3d. in 1899 and £3 13s. 8d. in 1895; with board the payments were £3 8s. 4d. in 1902, £2 18s. 7d. in 1899, and £2 10s. 1d. in 1895. The day wages of ordinary farm labourers in 1902, without board, averaged 4s. 8½d. per day, and 3s. 8½d. per day with board; while in harvest time the average

rate of payment was 6s. 4½d. and 5s. 7d. per day respectively. In consequence of the different descriptions of farming pursued in the United States, including as it does the great stock and grain farms of the west, the cotton, sugar, and rice farms of the south, as well as dairy, vegetable, and fruit farms, the variations in the wages prevailing in different States are very considerable.

One important factor in connection with farm wages, on which considerable emphasis is laid in this Bulletin, is the interrupted character of the employment. Farming that is limited to the production of local open field crops must, it is observed, have considerable periods of unoccupied time in the year, and in the Northern States there are three or four months of winter in which field work practically ceases; the possibility of cultivating a variety of crops is expanded as one goes southward, and dairying also modifies farm wages by providing occupation throughout the year. The one-crop farmer, however, whether raising wheat at the extreme north or on the Pacific coast, raising maize in the Upper Mississippi Valley or cotton, rice, or sugar in the south, only needs helpers at special seasons, and the able-bodied industrious man desirous of continuously employing his whole time finds his energies limited by the conditions of ordinary farming. This variable period of activity on the farm, especially when contrasted with the greater steadiness of employment in various manufacturing, commercial, or building enterprises, constitute, it is thought, one of the greatest difficulties in procuring help upon the farm.

The conditions of labour in the different States are greatly affected by the inflow of foreigners, but the immigration does not seem directly to relieve the scarcity of farm labour, as many of the new-comers are absorbed by the works in progress in connection with railroads, waterworks, and other large undertakings.

Hours of labour vary, but there is a general tendency, in the vicinity of railways, shops, and factories, to regard 10 hours as the working day, and it is becoming quite common to expect day hands to leave at the end of 10-hours' work; monthly hands work longer, and "from sun to sun" is a frequent statement of the hours of farm labour from some parts of almost every State. There is a somewhat general custom over the country to give dinner to day helpers and, in some cases, two meals.

A number of public holidays are observed in addition to Sunday, and payment for these is a matter of adjustment. In certain States, the irregularities of service caused by holidays and by idleness are so great that hiring for fixed periods has largely given way to hiring by the day, or, if hiring for longer periods is retained, deductions are made for all time lost.—*Journal of the Board of Agriculture.*

CONSERVATION OF QUEENSLAND BUSH GRASSES IN THE FORM OF ENSILAGE.

In December of last year Mr. J. Mahon, Principal of the Queensland Agricultural College, in concluding an article on "Ensilage of Bush Grasses," invited those who had any experience in connection with bush grass ensilage to communicate with him on the matter, so that a further investigation might be made. In response, Mr. Geo. L. Debney, of Woodlands, Bowen, writes the following interesting account of his experience in this direction. The success attending his experiments should leave no room for doubt that certain bush grasses and herbs make excellent ensilage:—

My first attempt was on the Diamantina River, West Queensland, in the year 1887, a year of exceptionally heavy rains and high floods. I may here state that the flood waters of the Lower Diamantina often have a spread of from side to side a distance of from 20 to 30 miles, and that after the floods subside the growth of wild sorghum, grass, and herbage is enormous, the former often growing to a height of 6 feet in a few weeks. This height is attained on

the rough ground, and is intermixed with Polygonum and blue bush; but on the higher ground, which is more open and level, where mowing-machines can be worked, it grows usually about 3 feet in height, and averages about 1 ton per acre, being mixed with red and other grasses, which form an undergrowth about 1 foot high.

After the flood of 1887, caused by heavy rains falling at the latter end of December of the previous year, had subsided, I started three mowing-machines to work cutting, with the intention of carting in a green state all that could be possibly done with the teams at my disposal, leaving that which could not be brought in green for hay. For this purpose a silo had been built of stone and cement. It was dug out to a depth of 10 feet below the surface, the floor being of solid rock, and the walls were carried to a height of 8 feet above ground, making a depth of 18 feet from top to bottom. As nearly as I can remember, the size was 12 × 10 feet. The distance from the station to where the sorghum was cut was 12 miles. Three wagons came in every other day with their loads. The fodder was somewhat wilted on arrival at the silo, but for sweet silage that is the proper state for it to be in. After the loads were deposited in the silo, the stuff was well trampled and then weighted with a number of coils of fencing wire, which happened to be at hand. A piece of iron piping was built in for the purpose of lowering a thermometer, in order to take the temperature, which rose during the filling to 160 degrees Fahr., but did not at any time exceed this temperature during or for a week after the silo was finished. When the silo was filled it was allowed to settle down for a week, when it was filled up again to the top, and finally weighted with eighteen small dray-loads of stone, which remained till the silo was opened. The filling took place in March, 1887, and the silo was opened in March, 1889.

After filling, it was temporarily roofed with galvanised iron.

The year 1889 on the Diamantina was a very dry year, and feed was very scarce. About this time there arrived on the station twenty head of valuable stud Shorthorns from Victoria, obtained on the dispersal of the famous stud herd of the late Mr. Robt. McDougal, and it was decided to feed the ensilage to them in preference to giving it to the studs bred and acclimatised on the station—these had to be satisfied with bush hay.

The new arrivals were turned out during the day, and brought to the yards at night and given a little hay and ensilage. The hay they ate, but they showed a decided disinclination to eat the ensilage, and it was not till the hay was stopped and they were properly hungry did they attempt to eat it.

In fact, I was for a time very much of opinion that I had wasted time and money in the attempt to make ensilage. A week after it was first fed to them they commenced eating it with a decided relish, and before many days it was eaten by them voraciously in preference to other kinds of feed. The ensilage was carted to them in a dray from the silo, and if it was not there at the usual time of feeding the stockman was reminded of the fact by their loud bellowing.

I may say that I considered my first attempt at ensilage a decided success, as it kept the cattle for several months till rain fell, the ensilage being the principal feed used.

The next attempt I made to convert native grasses into ensilage was in 1890, another good year on the Diamantina characterised by heavy rains and high floods.

I have before stated that the sorghum flats were 12 miles away from the station, and, as this entailed long carriage, I decided on trying stack ensilage, as I could stack it quite close to where it was cut. So, with this end in view, I obtained a sufficient number of Johnson's patent ensilage presses to press a stack of 100 tons. These consisted of drums and wire ropes, which need not be described, as they are well known. This year I had cut 300 tons of sorghum, 100 tons of which was converted in silage; the other 200 tons was stacked for hay, and remained in stack over two years.

Before commencing to stack the sorghum for ensilage, it was necessary to fix the drums on which the wire ropes were rolled for compressing the stack, and for this purpose logs had to be carted to the site of the stack, which was intended to be 24 × 16 feet. The logs required to be 18 feet long; but, being unobtainable this length, shorter logs had to be used, two being bolted together to make the required length. These long logs were then laid across the site of the stack, so that the ends would project 2 feet on each side of the stack when built, and on the top of these projecting ends other logs were placed running transversely the whole length of the stack, and bolted down to the crosspieces after the top was adzed flat for the drums to be bolted to. The drums were then bolted down with strong bolts of $\frac{7}{8}$ round iron. The drums were placed 3 feet apart on each side of the stack. The building was then proceeded with. On reaching a height of 10 feet the ropes were placed across the stack from drum to drum, and tightened with the levers, and left for a day or two to settle down, and this was done from time to time during the building, so that when the stack had reached a height over 20 feet it was to all appearance well compressed, but it continued sinking under the pressure exerted by the press and its own weight, but did not sink below 12 feet in height. The ropes were tightened from time to time for several weeks after the stack was finished. The temperature of the stack was taken from time to time also, an iron pipe being used as in the silo; and when the temperature rose above 160 degrees Fahr. more pressure was exerted, when the heat became less. This stack was not cut into till the summer of 1892-3, when it was fed to ninety head of stud cattle, and was eaten with quite as much relish as was that preserved in the silo. On cutting into the stack it was found to be dry on the outsides to a depth of 18 inches, but further in it had the appearance of light tobacco, and gave out a vinous odour, not at all unpleasant. There was no waste; every part of the stack was eaten. I was thus enabled to save ninety head of valuable stud Shorthorns, when the losses in the general herd amounted to 10,000 out of 17,500 head of well-bred Shorthorn cattle. From this time out, owing to adverse seasons, I was unable to get together more than a small quantity of fodder, although I had all the appliances for the purpose, and what little I did save in 1894 (about 100 tons of hay) was consumed by the studs in the drought of 1897, and from this out continued drought swept the herd out of existence. Since arriving here I have experimented with the native grasses, but I find that they are not succulent enough to make ensilage. I tried a small stack and weighted it with wires, across which were hung heavy logs; but the experiment failed entirely, and the grass stacked made neither hay nor ensilage. I am, however, so much impressed with the value of ensilage as a fodder for dairy cattle that I intend growing fodder for the purpose and stacking it, and I should be glad to know the best kind to grow for the purpose.

MARSH MALLOW OINTMENT.

Marsh mallows have, from time immemorial, been used for ointment for wounds. They are found growing in many parts of Queensland, and, be it observed, that they have not lost any of their healing virtues by their migration from the old country. The "cheeses," as the seeds are called by children in England, do not, however, seem to be so appreciated by colonial children as by that of Great Britain. The ointment is made as follows:—Pick nice fresh soft leaves and tops of shoots of the marsh mallow, chop or mince it up fine, then take some nice fresh hogs' lard, place it in a frying-pan over the fire; when melted strew the minced-up leaves of the mallow all over the pan. Let it gently simmer for about 15 minutes, pressing the leaves with the back of a fork to extract the juice; strain through fine netting into pots or jars and squeeze out all the juice possible. Elderberry and other ointments are made the same way.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

Returns from 1st to 31st May, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire	22 Nov., 1903	656	3·8	27·91	
Annie ...	,, ...	18 Feb., 1904	24	4·6	1·23	Dry, 5-5-04
Blanche ...	,, ...	17 Oct., 1903	307	4·8	16·50	With first calf
Bonnie ...	,, ...	19 Sept. ,,	415	3·4	15·80	
Blink ...	,, ...	27 April ,,	607	3·8	25·83	
Cockey ...	,, ...	22 Dec. ,,	556	4·8	24·09	With first calf
Lowla ...	,, ...	3 Mar., 1904	794	4·5	40·01	
Lass ...	,, ...	12 Mar. ,,	833	4·4	41·05	
Lonesome ...	,, ...	10 Feb. ,,	521	3·7	21·59	
Lavinia ...	,, ...	26 Nov., 1903	587	3·7	24·32	
Lena ...	,, ...	26 Feb. ,,	431	4·0	19·30	
Leasome ...	,, ...	27 Feb. ,,	497	4·2	32·37	
Lightning ..	,, ...	15 Jan., 1904	571	4·1	26·22	With first calf
Lulu ...	,, ...	26 Oct., 1903	362	3·6	14·59	With first calf
Laura ...	,, ...	3 Dec. ,,	635	3·5	24·89	
Linnet ...	,, ...	3 Jan., 1904	644	3·5	25·24	
Luck ...	,, ...	28 Nov., 1903	394	3·9	17·20	With first calf
Lottie ...	,, ...	28 Aug. ,,	130	4·8	7·98	With first calf ; dry, 11-5-04
Renown ...	,, ...	29 Feb., 1904	678	3·7	28·09	
Rosebud ...	,, ...	27 Nov., 1903	486	4·1	22·31	
Realm ...	,, ...	15 Dec. ,,	304	3·7	12·59	
Ruby ...	,, ...	18 Jan., 1904	579	3·7	23·98	
Ream ...	,, ...	15 Feb. ,,	349	3·6	15·19	
Ream Routhi	,, ...	3 April ,,	669	3·7	27·72	
Ruth ...	,, ...	15 Dec., 1903	517	3·6	20·84	
Blank ...	,, ...	10 May, 1904	464	4·8	24·94	
Alice ...	Shorthorn ...	28 April, 1903	218	4·5	10·98	
Chocolate ...	,, ...	17 Nov. ,,	458	4·7	24·09	With first calf
Cherry ...	,, ...	2 Feb., 1904	582	3·8	24·76	
Guinea ...	,, ...	16 Nov. ,,	514	4·0	23·02	
Gem ...	,, ...	18 April ,,	672	4·1	30·85	With first calf
Dott ...	,, ...	30 Sept., 1903	363	4·4	17·88	
Kathleen ...	,, ...	15 Jan., 1904	428	3·5	16·77	With first calf
Kit ...	,, ...	26 Mar. ,,	771	4·1	35·40	
Louisa ...	,, ...	3 Jan., 1903	414	4·5	20·87	
Lady Vixen	,, ...	16 Jan., 1904	619	3·7	25·65	
May ...	,, ...	16 Dec., 1903	487	3·8	20·72	
Nestor ...	,, ...	7 Jan., 1904	621	4·5	30·17	
Princess ...	,, ...	27 Nov., 1903	320	4·2	15·05	
Rose ...	,, ...	21 July ,,	44	4·9	2·41	Dry, 8-5-04
Queenie ...	,, ...	22 Mar., 1904	747	3·7	30·95	
Tottie ...	,, ...	11 July, 1903	352	3·8	14·98	With first calf
Violet ...	,, ...	7 April, 1904	591	3·7	24·49	
Winnie ...	,, ...	7 Oct., 1903	470	3·7	19·47	With first calf
Dora... ..	,, ...	1 May, 1904	487	4·1	22·36	
Peggie ...	,, ...	31 May ,,	*	*	*	
Plover ...	,, ...	5 May ,,	449	3·5	17·60	
Horney ...	,, ...	3 April ,,	738	3·8	31·40	
Bliss ...	Jersey	27 Feb. ,,	533	4·1	24·47	With first calf
Connie ...	,, ...	5 May ,,	73	5·2	4·25	Dry, 12-5-04
Cocoa ...	,, ...	17 Dec., 1903	365	4·6	18·80	With first calf
Carrie ...	,, ...	16 Jan., 1904	537	5·2	31·17	With first calf
Ivy ...	,, ...	1 Jan. ,,	479	4·4	23·60	
Jersey Belle	,, ...	2 Mar. ,,	597	4·4	29·42	
Tiny ...	,, ...	1 Dec., 1903	435	4·5	21·92	
Playful ...	,, ...	22 May, 1904	67	5·5	4·12	
Drone ...	Ayrshire Sh'rth'rn	7 Oct., 1903	391	4·4	19·26	
Haze ..	,, ,,	1 June ,,	233	4·8	11·74	Dry, 25-5-04

* Not recorded or tested until 1st June, 1904.

THE DAIRY HERD—*continued.*

Returns from 1st to 31st May, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Jeanie ...	Ayrshire Sh'rt'hn	6 Jan., 1904	679	4·1	31·17	
Madge ...	,, ,,	3 Jan. ,,	362	4·0	16·21	With first calf
Mince ...	,, ,,	10 Jan. ,,	401	3·6	16·16	With first calf
Nada ...	,, ,,	18 Jan. ,,	436	3·6	17·57	With first calf
Nina ...	,, ,,	10 Feb. ,,	424	3·8	18·04	With first calf
No. 46 ...	,, ,,	8 April, 1903	393	4·0	17·60	
No. 48 ...	,, ,,	4 Feb., 1904	651	4·4	32·10	
Ping Pong ...	,, ,,	18 July, 1903	424	3·9	18·52	With first calf
Rita ...	,, ,,	17 Oct. ,,	411	3·3	15·19	With first calf
Venus ...	,, ,,	13 Feb., 1904	434	3·9	18·95	
Lemon ...	Grade Shorthorn	19 July, 1903	297	3·8	12·64	Dry, 28-5-04
Lucy ...	,, ...	18 Oct. ,,	438	4·6	22·56	
Molly ...	,, ...	19 Feb., 1904	553	3·7	22·91	
Rosella ...	,, ...	27 Feb. ,,	613	3·8	26·08	
Brindle ...	Jersey Shorthorn	16 Dec., 1903	530	4·2	24·93	
Mona ...	Holstein Sh'rth'rn	8 Sept. ,,	402	4·0	18·00	
Angel ...	Holstein Devon...	11 Mar., 1904	754	3·8	32·10	
Night ...	,, ,,	12 Aug., 1903	198	4·6	10·10	Dry, 26-5-04
Whitefoot ...	,, ,,	10 Aug. ,,	122	4·8	6·55	Dry, 16-5-04
Reanie ...	Holstein Hereford	21 Sept. ,,	587	4·4	28·92	
Donah ...	Holstein	2 Feb., 1904	555	3·6	22·37	With first calf
Damsel ...	,, ...	3 April ,,	931	3·5	36·49	
Fancy ...	South Coast ...	14 Oct., 1903	681	4·6	35·08	
Grace ...	,, ...	28 Oct. ,,	374	4·2	27·59	
Lady Rose ...	Guernsey ...	1 Feb., 1904	325	7·0	25·28	Slipped calf

The cows were fed on natural pastures, and occasionally grazed on *Paspalum dilatatum* for a a few hours per day.

Returns from 1st to 30th June, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire... ...	22 Nov., 1903	602	4·0	26·96	
Blanche ...	,, ...	17 Oct. ,,	299	5·0	16·74	With first calf
Bonnie ...	,, ...	19 Sept. ,,	106	4·4	5·22	Dry, 20-6-04
Blink ...	,, ...	27 April ,,	442	3·6	17·82	
Cockey ...	,, ...	22 Dec. ,,	515	4·5	25·75	
Lowla ...	,, ...	3 Mar., 1904	698	3·9	30·49	
Lass ..	,, ...	12 Mar. ,,	732	4·0	32·79	
Lavinia ..	,, ...	26 Nov., 1903	87	4·4	4·28	Dry, 10-6-04
Leasome ...	,, ...	27 Feb. ,,	254	4·5	12·80	Dry, 30-6-04
Lena ...	,, ...	26 Feb. ,,	410	3·7	16·99	
Lonesome ...	,, ...	10 Feb., 1904	412	3·6	16·71	
Lightning ...	,, ...	15 Jan. ,,	522	3·8	21·21	With first calf
Lulu ...	,, ...	26 Oct., 1903	428	3·8	18·21	With first calf
Laura ...	,, ...	3 Dec. ,,	596	3·6	24·03	
Luck ...	,, ...	28 Nov. ,,	365	4·0	16·35	With first calf
Renown ...	,, ...	29 Feb., 1904	637	3·6	27·03	
Realm ...	,, ...	15 Dec., 1903	377	3·6	15·20	
Ruby ...	,, ...	18 Jan., 1904	602	3·8	25·62	
Ream ...	,, ...	15 Feb. ,,	164	4·1	7·53	Dry, 28-6-04
Rosebud ...	,, ...	27 Nov., 1903	502	3·8	21·36	
Ream Routhi	,, ...	3 April, 1904	612	3·8	26·04	
Ruth ...	,, ...	15 Dec., 1903	568	3·6	22·90	
Linnet ...	,, ...	3 Jan., 1904	555	3·6	22·37	
Blank ...	,, ...	10 May ,,	819	4·1	37·50	
Amy ...	,, ...	5 June ,,	757	3·7	31·37	

THE DAIRY HERD—*continued.*

RETURNS FROM 1ST TO 30TH JUNE, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Chocolate ...	Shorthorn ...	17 Nov., 1903	440	4·5	22·17	With first calf
Cherry ...	„	2 Feb. 1904	504	4·0	22·57	
Dott ...	„	30 Sept., 1903	70	4·5	3·52	Dry, 18-6-04
Dora ...	„	1 May, 1904	726	4·0	32·52	
Guinea ...	„	16 Nov., 1903	273	4·8	14·67	Dry, 30-6-04
Gem ...	„	18 April, 1904	616	3·9	26·90	With first calf
Horney ...	„	3 April „	624	3·9	27·25	
Kathleen ...	„	15 Jan. „	382	3·6	14·34	With first calf
Kit ...	„	26 Mar. „	654	4·0	29·29	
Louisa ...	„	3 Jan., 1903	417	4·1	19·14	
Lady Vixen	„	16 Jan., 1904	609	3·6	24·55	
Mary ...	„	16 Dec., 1903	323	4·0	14·47	
Nestor ...	„	7 Jan., 1904	520	4·0	23·29	
Peggie ...	„	31 May „	692	3·6	27·90	
Princess ...	„	27 Nov., 1903	419	3·9	18·30	
Queenie ...	„	22 Mar., 1904	716	3·6	27·03	
Tottie ...	„	11 July, 1903	44	4·5	2·21	Dry, 10-6-04
Violet ...	„	7 April, 1904	706	3·6	28·46	
Winnie ...	„	7 Oct., 1903	274	4·5	13·80	Dry, 27-6-04
Plover ...	„	5 May, 1904	533	3·4	20·29	
Bliss ...	Jersey	27 Feb., 1904	518	3·8	22·04	With first calf
Cocoa ...	„	17 Dec., 1903	105	4·2	4·93	Dry, 24-6-04
Carrie ...	„	16 Jan., 1904	504	5·5	31·04	With first calf
Ivy ...	„	1 Jan. „	367	4·7	19·31	
Jersey Belle	„	2 Mar. „	393	4·6	20·24	
Tiny ...	„	1 Dec., 1903	381	4·2	17·92	
Playful ...	„	22 May, 1904	560	4·3	26·96	
Connie ...	„	4 June „	295	4·5	14·86	
Effie ...	„	22 June „	87	4·5	4·38	
Drone ...	Ayrshire	7 Oct., 1903	348	4·0	15·59	
Jeanie ...	Shorthorn ...	6 Jan., 1904	631	3·9	27·56	
Madge ...	„	3 Jan. „	98	4·1	4·50	Dry, 20-6-04
Mince ...	„	10 Jan. „	383	3·7	15·87	With first calf
Nada ...	„	18 Jan. „	341	3·8	14·51	With first calf
Nina ...	„	10 Feb., 1904	366	3·6	14·86	With first calf
No. 46 ...	Ayrshire Sh'rth'rn	8 April, 1903	349	4·2	16·41	
No. 48 ...	„ „ ...	4 Feb., 1904	429	4·0	19·21	
Ping Pong ...	„ „ ...	18 July, 1903	368	3·6	14·83	With first calf
Rita	„ „ ...	17 Oct. „	350	3·5	13·72	
Venus ...	„ „ ...	13 Feb., 1904	432	3·6	17·53	
Lucy ...	Grade „ ...	18 Oct., 1903	69	5·0	3·86	Dry, 18-6-04
Molly ...	„ „ ...	19 Feb., 1904	406	3·6	16·36	
Rosella ...	„ „ ...	27 Feb. „	611	3·7	24·71	
Rowly ...	„ „ ...	17 June „	333	3·5	13·05	
Brindle ...	Jersey „ ...	16 Dec., 1903	490	4·0	21·95	
Mona ...	Holstein Sh'rth'rn	8 Sept. „	44	4·6	2·26	Dry, 18-6-04
Angel ...	„ Devons	11 Mar., 1904	719	3·7	29·79	
Whitefoot ...	„ „ ...	20 June „	333	3·6	13·32	
Donah ...	„ Hereford	2 Feb. „	410	3·8	17·44	With first calf
Reanie ...	„ „ ...	21 Sept., 1903	524	4·0	23·47	
Damsel ...	Holsteins ...	3 April, 1904	797	3·6	32·13	
Fancy ...	South Coast ...	14 Oct., 1903	613	4·2	28·83	
Grace ...	„ „ ...	28 Oct. „	431	4·0	19·30	
Lady Rose ...	Guernsey ...	1 Feb., 1904	298	6·8	22·69	Slipped calf
Witch ...	Grade Jersey ...	10 June „	684	3·9	29·87	

The cows were fed on natural pastures, with also green barley, oats, and lucerne, and occasionally grazed on *Paspalum dilatatum* for a few hours daily.

TABLE OF MILK TESTS AT BIGGENDEN PASTORAL AND AGRICULTURAL SOCIETY'S SHOW.

7th and 8th July, 1904.

Conditions:—Milch cow, any breed, yielding the greatest quantity of butter fat to be awarded the prize. The cow to be on the show grounds at 5 p.m. on the evening previous to the show, and to be milked dry in the presence of the judge or steward; milking competition to take place at 7 a.m. and 5 p.m. on each day of the show; given by Department of Agriculture (£1 1s.), Maryborough Newspaper Co. (one year's subscription to *Colonist*, value 20s.), £2 1s.; second prize given by A. G. New, Esq. (cream can), value 15s.

FIRST DAY.

	Name of Owner.	Name of Cow.	Lb. of Milk.	Per cent. of Butter Fat.	Lb. of Commercial Butter.	Totals. Morning and Evening.
Morning.	Mr. F. G. Jones ...	Frisky	13	4·7	·684	1·248
	Mr. C. Summers ...	Tiny	15	3·9	·655	1·340
	Mr. W. Fowler	Lady	10½	4·9	·575	1·296
	Mr. T. Summers ...	Darkie	12	3·8	·510	1·000
	Mr. W. Bates	Buttercup	11½	3·6	·463	1·042
	Mr. F. G. Jones ...	Silky	15	5·0	·840	1·485
	Mr. C. Summers ...	Blackbird	15	3·8	·638	1·204
	Mr. W. Fowler	Connie	16½	4·4	·813	1·416
	Mr. F. G. Jones ...	Lady Kenmore ...	11¾	5·0	·657	1·113
	Mr. T. Summers ...	Rosie	9	3·9	·393	·722
	Mr. W. Fowler	Champion	19	3·5	·744	1·402
	Mr. F. G. Jones ...	Microbe	13	4·4	·640	1·130
Evening.	Mr. F. G. Jones ...	Frisky	10½	4·8	·564	
	Mr. C. Summers ...	Tiny	12¾	4·8	·685	
	Mr. W. Fowler	Lady	14	4·6	·721	
	Mr. T. Summers ...	Darkie	9¾	4·5	·490	
	Mr. W. Bates	Buttercup	11	4·7	·579	
	Mr. F. G. Jones ...	Silky	12	4·8	·645	
	Mr. C. Summers ...	Blackbird	11½	4·4	·566	
	Mr. W. Fowler	Connie	12¼	4·4	·603	
	Mr. F. G. Jones ...	Lady Kenmore ...	8½	4·8	·456	
	Mr. T. Summers ...	Rosie	7	4·2	·329	
	Mr. W. Fowler	Champion	14	4·2	·658	
	Mr. F. G. Jones ...	Microbe	9¾	4·5	·490	

SECOND DAY.

	Name of Owner.	Name of Cow.	Lb. of Milk.	Per cent. of Butter Fat.	Lb. of Commercial Butter.	Totals. Morning and Evening.
Morning.	Mr. F. G. Jones ...	Frisky	13	4·6	·669	1·201
	Mr. C. Summers ...	Tiny...	15½	3·8	·659	1·344
	Mr. W. Fowler	Lady	13½	4·3	·649	1·265
	Mr. T. Summers ...	Darkie	11	3·3	·406	1·036
	Mr. W. Bates	Buttercup	14½	3·7	·600	1·218
	Mr. F. G. Jones ...	Silky	15½	5·0	·868	1·471
	Mr. C. Summers ...	Blackbird	15½	4·0	·694	1·267
	Mr. W. Fowler	Connie	17½	3·5	·685	1·480
	Mr. F. G. Jones ...	Lady Kenmore ...	11	5·0	·616	1·130
	Mr. T. Summers ...	Rosie	8½	4·0	·380	·724
	Mr. W. Fowler	Champion	19	3·2	·680	1·419
	Mr. F. G. Jones ...	Microbe	13½	4·3	·649	1·201
Evening.	Mr. F. G. Jones ...	Frisky	9½	5·0	·532	
	Mr. C. Summers ...	Tiny...	12½	4·9	·685	
	Mr. W. Fowler	Lady	11	5·0	·616	
	Mr. T. Summers ...	Darkie	11½	4·9	·630	
	Mr. W. Bates	Buttercup	11½	4·8	·618	
	Mr. F. G. Jones ...	Silky	11	4·9	·603	
	Mr. C. Summers ...	Blackbird	12½	4·1	·573	
	Mr. W. Fowler	Connie	14½	4·9	·795	
	Mr. F. G. Jones ...	Lady Kenmore ...	9	5·1	·514	
	Mr. T. Summers ...	Rosie	7	4·4	·344	
	Mr. W. Fowler	Champion	15	4·4	·739	
	Mr. F. G. Jones ...	Microbe	10½	4·7	·552	

Order of Merit.

	Silky.	Connie.	Champion.	Tiny.	Lady.	Blackbird.	Frisky.	Microbe.	Buttercup.	Lady Kenmore.	Darkie.	Rosie.
Lb. Commercial Butter	2·95	2·89	2·82	2·68	2·56	2·47	2·44	2·33	2·26	2·24	2·03	1·44

TABLE OF MILK TESTS—*continued.*

JUDGING BY POINTS.

Conditions:—Milch cow, to be judged by points; 1 point to be awarded for every 10 days since calving, deducting the first 40 days, with a maximum of 14 points; 1 point for every pound of milk, taking the average of two days' yield; 20 points to be awarded for every pound of marketable butter, indicated according to the Babcock test. First prize, given by W. A. A. Bates, Esq. (1 two-year-old heifer), value £3; second prize, given by W. Fowler, Esq. (10s.), R. Brook, Esq. (10s.), £1; third prize, given by C. Summers, Esq. (10s.), T. Summers, Esq. (5s.), 15s.

Name of Cow.	Points for Time in Milk.	Points for Weight of Milk.	Points for Butter Fat.	Total Points.
Champion	...	33	56·4	89·4
Lady	14	24	51·2	89·2
Connie	1	30	57·8	88·8
Tiny	7	28	53·6	88·6
Silkie	...	27	59·	86·
Blackbird	3	27	49·4	79·4
Lady Kenmore	14	20	44·8	78·8
Frisky	...	23	48·8	71·8
Microbe...	...	23	46·6	69·6
Darkie	...	22	40·6	62·6
Rosie	14	16	28·8	58·8

WART ON COW'S TEAT.

Here is still another remedy for warts on teats. It comes from the *Scottish Farmer*, in reply to a correspondent who had a "yeld quey" coming two years old, which had a large wart growing on the point of the teat about the size of a hen's egg. Why he allowed it to grow to that size is not stated. However, the following remedy was given:—

Warts may be removed by excision or torsion, twisting and pulling being sometimes sufficient. To obtain correct treatment you should have described the growth, and stated whether there was a constriction or neck at the base of the tumour. If there is a constriction or neck to the wart, close to the teat, apply a catgut ligature very tight round the neck, and the tumour will slough off; but in some cases the animal requires to be cast and the wart removed with a sharp knife. A firing iron should be applied afterwards to prevent renewal of the growth.

A very effective way of removing, should the growth prove a wart, is to see that a ligature, such as a strong thread, can be tied tightly round the base where it is attached to the skin. It prevents the circulation of the blood, and the part gets deadened, when it will likely drop off in a few days.

The term "yeld quey" means a "barren young cow."

A NEW FIBRE PLANT.

Planting Opinion says:—The following mysterious paragraph is culled from *Indian Planting and Gardening:*—A new fibre plant will shortly be experimented with in Calcutta, the fibre of which cannot be distinguished from that of Rhea. It has one great advantage over Rhea—there is no gummy substance to be overcome. There is much secrecy observed about the identity of the plant. We are, of course, acquainted with the plant, but are bound down to secrecy for the present. The fibre is very fine indeed, and if the reports on it from London are favourable a large plantation will be put down at once.

The Horse.

LIGHT HORSE NOTES.

He doth nothing but talk about his horse.—OTHELLO.

There is, perhaps, no writer who has contributed more valuable material to the history of the horse than Professor J. Cossar Ewart. He is a scientific man, a naturalist of high standing, and he is a practical breeder as well, and anything he has to say about horses is well worthy of careful study. It is for this reason that I draw attention to an article from his pen which appears in the recently-issued volume of the Highland and Agricultural Society's Transactions—perhaps the most valuable paper on horses that has appeared in recent years. In that article Professor Cossar Ewart discusses the multiple origin of horses, and the question, though a historical one, has, to my mind, such an important bearing on practical horse-breeding that the Highland and Agricultural Society would do well to issue it in the shape of a pamphlet.

It has been a tradition that the modern horse has been evolved from the prehistoric Hipparion, and that all our breeds of horses have had a common origin—the varieties as we now know them arising from climatic causes, from selection, natural and artificial, and from other causes into which it is not necessary to enter here. It has always seemed to me a wonderful thing that the heavy and somewhat phlegmatic shire horse and the high-spirited thoroughbred should spring from exactly the same source, and, no matter how many thousands of years were given for the evolution, the difficulty was still there. The discovery of the Prjevalsky's horse (Equus Caballus prjevalski) has effectually removed that diffiuclty by showing that it never existed, and that our horses are descended from many types, some of which have been classified.

It is not within the scope of the present article to follow Professor Ewart through his close reasoning, but some of the facts he mentions may be briefly referred to. The discovery of Prjevalsky's horse has been invaluable to naturalists, for Prjevalsky's horse is of different species to two species that are existing at the present day. And by different species I do not mean different types, as it is usually understood, but that the bones, teeth, &c., show a marked difference. The three species which Professor Cossar Ewart differentiates are Prjevalsky's horse, the Celtic pony, and the Norse horse. The former has the chestnuts and ergots of the common horse, the hind chestnuts being long and narrow, but which differ from the common horse. In the mane and tail, however, he differs materially. His mane and tail—or, rather, two-thirds of the latter—are renewed once a year, and the hair grows out from the sides as well as from the back of the dock. The Celtic pony is, as Professor Ewart pointed out, a highly specialised variety. The mane, to begin with, is different from that of any other variety. It grows in the stallion at the rate of from 9 to 10 inches in the year, and, as only about a third of the hair is shed every year, it grows to a great length. The tail, too, is very remarkable. The dock is so short that one would think it had been docked, and so long does it grow that it almost trails on the ground. A third of the upper portion of the dock, to the extent of about a third, is covered with short, stiff hair, from 3 to 6 inches long, which forms a tail-lock, and is a very effective protection against a snowstorm. "Provided with a caudal shield, long thick hair over the hindquarters and back, and a thick mane covering both sides of the neck, and protecting the small ears, the Celtic pony is practically snow-proof," writes Professor Ewart. The Celtic pony has no hind chestnuts, the front chestnuts are small, and the fetlock callosities are not to be found.

Of the Norse horse (Equus Caballus hjpicus) Professor Ewart says:—"In neck and shoulders, trunk and limbs, he may be said to be an intermediate between a true pony and a small cart horse of the Suffolk type." He has a full set of chestnuts and ergots, in which he differs from the two types I have already referred to. In another important respect he also differs from them, and that is in the eyes, which in the Celtic pony are large and forward-looking, whilst in the Norse horse they are small and have a downward look, and in the wild horse the eyes are some distance from the front of the head. The tail, too, differs from both breeds, inasmuch as it is exceptionally low in the setting on, and the dock is longer than that of the Celtic pony, but not so long as that of the wild horse.

There are, of course, other and important differences between the three species, but I have mentioned plenty to show that great differences in structure do exist, such differences as make it impossible that they should have a common origin. As Professor Ewart says, "It is inconceivable that the Norse variety should revert to the Prjevalsky horse type, or be regarded as an offshoot from the Celtic pony."

And the practical outcome of Professor Ewart's article, in which the similarity and differences between the drawings in the Combarelles, La Mouthe, and other caves to some of our modern breeds is, to use his own words, that "it may be possible to improve the quality or add to the size and substance without the help of highly specialised artificial alive breeds, devoid alike of the hardness and the intelligence so essential to a semi-wild life." This is what our breeders need to keep in mind, but which, in the endeavour to breed the saleable animal—that is, the fashionable animal—is too often lost sight of. With the new light that has been thrown upon breeding by the researches of Professor Ewart and others, it is quite possible, indeed probable, that we shall see in the course of a few years a revolution in horse-breeding—at any rate, as regards our older breeds. And it does seem important to maintain as far as possible characteristics which have lasted since the days of the Cave dwellers, and which, if lost, would probably not be replaced by anything better.—*Live*

ADVANTAGES OF SMALL SHOWS.

At a Wynyard Tenants' Show lately the Marquis of Londonderry made an interesting speech, in the course of which he said the Duke of Portland was the originator of what were called the tenant shows of this country, and he was glad his example had been so largely followed. He was an advocate of small shows, because he considered it was the small shows that gave a chance to the small men, and acted as feeders to the local shows, which again acted as feeders to the county shows, and from the county shows as feeders to the Royal. Shows were a practical lesson to the agriculturist to breed the best stock and the best stock only. To his mind the improvement in their breed of cattle and horses was due to the large number of small, but to him very important, agricultural shows that were held in the district and the country generally. In like manner they tended to a very great extent to improve the condition of the tenant farmer, because through the shows they had found that by breeding good cattle and good horses they had been able to realise prices which had largely counteracted the low prices which had been made in other branches of their industry.

Poultry.

GOOD TABLE FOWLS.

Method in Breeding Required.

The art of breeding and rearing good table poultry is best understood by those who have made a study or a business of it. Really good table fowls are not produced by chance; they are the product of thought and skill, and as such a higher value is placed upon them than the ordinary production of the average farmyard, which is so frequently marketed to comparatively small advantage. There is a good opening almost everywhere for a high-class table fowl, and there can be no doubt that those who made it a part of their business in an intelligent way to meet this requirement would find it quite profitable. There will always be plenty of poor-shaped, poor-coloured, and rather skinny fowls in every market, and these will always go cheap; but something better than these is continually demanded for the tables of those who are in comfortable circumstances, and for better-class birds higher prices will invariably rule. Even without any special cramming process, very fine fowls can be produced for provincial markets, while for a special trade fowls which have been fattened in confinement by cramming take the highest position both as regards quality and value. The very highest and also second-grade fowls can always find a good market at remunerative prices, but below that standard only very ordinary prices rule, and it does not pay to produce such birds as a chief part of any poultry undertaking.

Those who wish to breed high-class table poultry should get rid of the idea that almost any kind of stock will do for the purpose. Look into the shop window of a poulterer in any busy provincial town and see how many thin-breasted, coarse-boned, and yellow-skinned specimens are offered for sale. Here and there a full-breasted, heavily-fleshed, evenly-fatted, and fine-coloured bird is to be seen, and such are the specimens which the vendor himself desires but can seldom procure. Probably such birds represent but 10 per cent. of his sales, much to his loss as well as of those who might easily produce them. To breed first-rate table fowls, only good models must be selected in the shape of breeding stock.

Breed Not Essential.

If a bird possesses all the points of a good table fowl it is of no consequence what breed or cross it belongs to. If it is judiciously mated it will throw a satisfactory proportion of birds like unto itself. But the points of a good table fowl are found represented in but a few breeds, and selection is in consequence considerably narrowed. And not every specimen of what are known as table breeds of poultry is well fitted for the production of table fowls. Not by any means. I have handled many a Dorking, many an Indian Game, many a Houdan, and many an Orpington which I would never have included in a pen put together for the breeding of the best class of table fowls. But it may be said generally that from among these breeds, and one or two others of merit, the best table fowls can usually be produced.

No bird should be selected for stock purposes which is not a very fine specimen of a table fowl, or would be if it was fatted up. It is necessary to make this qualification, as every breeding bird, no matter what the purpose may be, should only be in fair condition and free from the slightest excess of fat as long as it is employed in the breeding-pen. The first thing to look at is the shape. See that the bird is broad and deep in body, not apparently so, but

really so, as profuse feathering is often deceptive unless the bird is actually handled. The breast bone should be straight and well-formed, and as deep as possible. A long breast bone is often a shallow one, but not always, and the two points should be sought for in combination. A breast bone which shows any indentation is better avoided, because, although this feature may have been produced by too early perching upon a spar, it may, on the other hand, be congenital and a sign of weak constitution. The back should not be too long; the thighs muscular, and the legs of fair stoutness and set well apart. Coarse bone is often a sign of coarse flesh, and this feature in excess should be avoided. The skin should be thin and white, and the shanks preferably white or pinky-white.

YELLOW-SKINNED BIRDS.

are not liked in the London markets, although this objection is less pronounced in all provincial centres. In America the yellow leg and skin are considered to be inseparable attributes of a good table fowl, but it is more or less a matter of prejudice on both sides, although the specially fine and juicy flesh of the Dorking is responsible for much conservative English opinion on the subject. If we look at what our neighbours across the Channel are doing, we shall find that they have no particular preference for white legs, although they insist upon white skin, and doubtless this is very correct. Some of the best French table fowls, such as Crèvecœurs, La Flèche, Bresse, Du Mans, &c., have dark legs. Yellow skin, I think, does not look well on a fowl unless the bird is to be roasted, but it must be noted that some yellow-legged breeds have very thin light-coloured or white skins—at least, many specimens of them have; and such birds are very useful for the production of good table poultry. For instance, the Indian Game has yellow legs, which usually go paler the older the bird gets, but many specimens have fine white skins, and this, coupled with the well-packed masses of meat which it carries, makes it one of the best fowls we have for crossing with a white-legged and white-skinned breed, such as the Dorking or Houdan.

Those who breed for a market where white legs and skin are insisted upon should mate up their stock birds to meet this requirement, but where such a preference is hardly felt there is little use in endeavouring to create one by supplying exclusively stock of this kind if good birds with other coloured legs come equally handy. But, while some latitude may very well be allowed to the colour of the leg, I think there should be none to that of the skin; a thin white skin should always be insisted upon in the case of a good table fowl.

As showing how comparatively small a value our neighbours the French put upon the colour of the legs of their table poultry, the present widespread popularity of the Faverolles may be instanced. This breed has white-coloured legs, but they are feathered down the side. Some people on this side may have a preference for white legs, but they have the greatest objection to feathered shanks.

THE DORKING.

I have little more than mentioned the names of a few breeds well suited for breeding table fowls. Foremost of them all stands the Dorking, noted for the fine quality of its flesh and for its white legs and skin. Perhaps it is not the hardiest of fowls, and that may account for the comparatively small number sent to market, but in favourable situations it pays well enough to raise them for the purpose. Where many Dorkings fail is in depth of breast, and this is altogether remedied by crossing wth the Indian Game. The latter communicates great fulness of flesh on the breast and other good parts, while flavour and quality are added which are absent from either of the breeds in its pure state. This cross is very hardy, but does not mature so rapidly as several others; although when quite ready for the market, there is nothing to equal it for quantity and quality of flesh.—*Farmer and Stockbreeder.*

PROFIT ON FOWLS.

So much has been and is being written on the question of the profits to be derived from poultry and eggs that we welcome all authenticated information on the subject. Since Mr. Fern was deputed by the Secretary for Agriculture to lecture throughout the State on the poultry industry, a lively interest has been awakened in this matter, and in most districts much more attention is being paid to poultry-raising and egg production than heretofore. A South Australian farmer, Mr. H. Martin, lately read a paper before the Miniaton Branch Bureau of Agriculture on the subject of the cost of feed for poultry. His paper was entitled "Will it Pay to Feed Fowls on Wheat at 5s. per Bushel?" He reminded members of the discussion on this point last year, when wheat was fetching 5s. per bushel, and most farmers appeared inclined to the belief that it would not pay to use clean wheat for fowls' feed. He determined to test the matter for himself, and, by feeding the fowls at three different times on good wheat, he found that a bag lasted about 100 fowls for two weeks. This meant twenty-six bags for the year, or £27 6s. for food. During the year ended 31st December, 1903, his fowls laid 13,434 eggs, and the price received worked out at 9d. per dozen, or a total of £41 2s. 11d., besides which he sold twenty-four fowls for 1s. each, and killed others for eating. He had, therefore, a little over £14 clear for his trouble of feeding and looking after the fowls. Considerable discussion ensued, and it was unanimously resolved that, in the opinion of this branch, it will pay to feed fowls on wheat, even at 5s. per bushel, but to secure this result they must be properly looked after.

EGG-LAYING COMPETITION AT ROSEWORTHY COLLEGE, SOUTH AUSTRALIA.

A correspondent of *Garden and Field* cannot understand the reason for the difference in the number of eggs laid by his Leghorns at the College competition and the number laid by their sisters at his own farm. He makes a very sensible suggestion to competitors, and that is, that they should set aside a pen of six similar fowls to those at Roseworthy and keep an account of the number of eggs laid in their own yards as compared with those at the College:—

I have started to do so with sisters of those at Roseworthy, and so far the difference is striking. My pen here have laid 43 eggs in 14 days, while the pen at the College only have 6 to their credit in the same time. I was unable owing to illness to keep a complete record of what my own hens laid last year, but it was undoubtedly far and away better than the number laid by similar hens at Magill, being well over 200 per pen. Several are still laying, although they have been at it for over 14 months. For the last few weeks of the last competition my hens were laying 25 every week, while at Magill their sisters could only produce 15, 12, 4, 4, for the last 4 weeks.

What is the reason of it? I've no time for writing to the newspapers, but other of your readers might like to air their views.

This is where the correspondent "Leghorn" makes the mistake. He should write to the newspapers. Agricultural newspapers have the machinery at their disposal for finding reasons and facts which the outsider does not possess, and any amount of trouble and expense is incurred in satisfying the questions of correspondents. In this case the editor, whilst expressing diffidence in answering, yet gives a complete answer to "Leghorn's" question. He says:—If "Leghorn" had asked us something easier we should have essayed an answer with more confidence than we feel at present. Perhaps he will find some satisfaction in the thought that he is by no means singular in his experience, for we know of quite a number of competitors who are at present watching the performance, or rather absence of it, in their birds at Roseworthy

with mingled astonishment and disgust. In the first place, "Leghorn" and others may be quite sure that their birds are getting every chance at the College. Indeed, the variety and excellence of their daily fare would make an ordinary hen envious—perhaps, by the way, it is making "Leghorn's" representatives bilious. Seriously, though, Mr. Day reports that all the birds are in the best of health and condition, and the doings of the Sunnyhurst Leghorns, Mr. Smith's Silvers, and Mr. Laidlaw's Buffs show that there is nothing wrong with the conditions up there. The probable explanation of the trouble is that the unusually mild autumn, coupled with a complete change of condition and feeding, has in a number of cases thrown the birds into moult. If this is so, it will, of course, tell heavily against our totals for the first few weeks. On the other hand, we shall probably gain at the back end of the competition.

POULTRY FOR PROFIT.

Mr. R. Eddison (hon. treasurer of the Poultry Club of Queensland), being interviewed by a representative of the *Daily Mail*, was asked his opinion as to the late annual show of the Poultry Club.

"A great success," he said, "both as regards the number and quality of the exhibits and the financial results. The takings at the gate were double those of last year, and sales of catalogues and other receipts all showed satisfactory increases. Our list of members is steadily increasing, and several outside societies have affiliated and adopted our rules and regulations for their poultry section. We find, too, that our list of approved judges is much appreciated by the executive of provincial shows. To stimulate competition at country shows, the Poultry Club gives a medal to all affiliated clubs or societies.

"My favourite breeds?" Well; I like them all. Leghorns, Langshans, Wyandottes, and Hamburgs are my special favourites. Remember, I am only a fancier, and keep these varieties as a hobby, but at the same time I have always managed to combine pleasure with profit. Having been fairly successful at the leading shows for many years, I get a good share of applications for both eggs for setting and young stock. Brown Leghorns were my first fancy, and a really good Brown Leghorn cockerel is still, in my opinion, the most handsome bird of any variety. The hens, too, if of good quality, are very beautiful, and, of course, are capital layers.

"The best layers?" My dear fellow, there is no best. It is simply a matter of strain. Until recently, very little interest was taken in this matter—a hen was a hen to most people, and all hens laid eggs, but egg-laying competitions are doing much to demonstrate what a handsome profit can be made from poultry. Of course, reasonable care must be taken to select first the particular variety that one has a fancy for, and then, of much greater importance, to purchase stock or eggs from a reliable breeder who keeps a good laying strain.

"Well, yes, I have shown some pretty good Langshans from time to time. This has always been one of my pet breeds. They are capital layers in the winter, when eggs are dear; and, as regards quality for table purposes, they cannot be excelled. They lay a good-size dark-brown egg, always attractive on the table.

"Without a doubt the most popular variety in Australia at the present time is the Wyandotte. They have proved in recent egg-laying competitions in the southern States that they are excellent layers, while the quality of the flesh as a table fowl is everything that could be desired. For the fancier they have great attractions, as high-class Wyandottes are unquestionably very beautiful birds, the nicely defined lacing on the laced varieties, together with their symmetrical proportions, making a combination unrivalled.

"Another variety that has always been a great favourite of mine is the Hamburg. Rather small? Certainly they are small, but they are so elegant and beautiful, with matchless combination of colour and marking, and in

addition are such fine layers that it is surprising that more people do not keep them. Now, I have kept the black and silver-spangled varieties for years. If I use a two-year-old cock, then I select as his companions about six of my best pullets. It is a great mistake to put only two or three hens in the breeding pen, as the result is often a large proportion of infertile eggs.

"It is a hard matter to lay down any hard-and-fast rule as to the size of pens. So much depends on the variety, space at one's disposal, nature of the soil, and a host of other things. Breeding pens should be at least 30 feet by 12 feet.

"It is a little difficult to say just which is the most profitable breed for the farmer. It depends entirely what he intends to go in for. As layers only, where there is a good run, I think that White Leghorns are about the best; but as all-round utility fowls, suitable for our farmers, I should recommend either the Wyandotte or the Orpington. Both are good layers and first-class table birds. For an ideal fowl for export, particularly for the English market, I do not think you could beat a cross between an Indian Game rooster and Buff Orpington hens. The result of such mating is a fine weighty bird that is hardy and matures early, having the deep breast and white skin that is so acceptable on the home market."

In conclusion, Mr. Eddison was asked his opinion of the future of the industry, to which he replied:—

"There is no doubt that here in Queensland it will go ahead in leaps and bounds. No, I am not a bit too optimistic. Dozens of people learnt in the past, hundreds are learning now, and thousands will learn in the near future, what a valuable addition can be made to one's income by keeping poultry of the right class. They must be bred with judgment from good sound stock, not in the happy-go-lucky style that has been so much in evidence in the past. The way to fill the egg-basket is by breeding from good layers only, while the stock generally must be improved by careful mating in the breeding pens, selecting such birds only as are true to type and have healthy, robust constitutions."

Mr. J. Beard, of Queen street, Brisbane, has furnished the *Daily Mail* with the following interesting remarks on poultry-breeding. Mr. Beard is well known as a successful poultry breeder and exhibitor, and his opinions are of great value to poultry-breeders:—

I have been raising chickens ever since I can remember. The first birds that I had for my very own were some bantams—perky little rascals that have made me have a sort of sneaking regard for the breed ever since. We boys used to raise birds for exhibition, principally Hamburgs. We got the eggs at a nominal figure, hatched them out, and sold the chickens back to the original owner as high as 5s. each. Of course that was before the day of the incubator. I have always liked the Hamburg. They are too small to be classed as a utility breed, but they are free layers of good-sized eggs, especially the Blacks. In 1887 I imported the first Wyandottes into Queensland. The poultry critics of the day who did not approve of speckled hens criticised them very adversely, prophesying that they would never become popular. I often smile when I think of the boom in Wyandottes at present, and recall those opinions. The same year I brought the first Plymouth Rocks into the State, and three years later the first Langshans. These Langshans were afterwards shown in Sydney. The male bird had a slight defect in one eye, for which the judge passed him, but during the show he was claimed at the value I had put upon him, 17 guineas.

Plymouth Rocks have always been favourites of mine. I first showed in 1890, and have won consistently ever since. Altogether for the different varieties I have secured just on 2,500 prizes in Queensland and New South Wales.

Taken all round, our purebred stock is well up to the average of that in the other States. People often pay Southern breeders a bigger price for birds of poorer quality than they could buy from local fanciers. I don't say this because I am a local fancier myself; but there is an obvious advantage in being

able to visit a man's yard and pick out just the bird you take a fancy to. Of course big breeders can afford to import first-class stock from England and America. They raise what birds they require from these; then the smaller man is able to buy the progeny at a much lower figure.

The ordinary barndoor fowl in Queensland is about as poor a specimen as anyone could imagine. The bulk of them are miserably small, and such wretched layers that they do not pay for their keep. Things, however, are on the mend. The appointment of a lecturer by the Agricultural Department was a good move, and the Press has done much to impress upon the farmers the necessity for improvement.

To my mind, the best fowl for the farmer to raise is a cross between the Indian Game and Buff Orpington. The Plymouth Rock is a good farm fowl, but it matures rather slowly.

A common mistake that our farmers make is in selecting their male birds. When they wish to change their rooster they frequently exchange with a neighbour, and thus lay the foundation of a mongrel flock, unfitted alike for table or egg production. Payment of half a sovereign or so would provide them with a purebred rooster, whose influence on the flock would mean money in pocket. The progressive dairyman does not swap a bull with his neighbour for a useless inferior specimen.

There is no risk whatever of over-production. One of our large meat export companies is prepared to buy an almost unlimited number of birds for shipment. They insist, however, on the quality being up to standard. Birds for export should weigh from 4 lb. to 5 lb. after being dressed. For the English market, white legs and white skins are preferred. Eggs shipped in cold chambers may be sent to any part of the world. Infertile eggs procured by running no rooster with the hens are to be preferred for export.

Duck-raising is rapidly gaining favour, and is one of the most profitable branches of the poultry business. The ducks at the recent show were splendid specimens, the best ever shown in the State. The local market is, unfortunately, rather unsatisfactory. There is no standard of quality or price, and the least advance in the supplies causes a glut and a consequent slump in values. There is, however, a steady demand at fair prices for export. The cross between the Pekin and the Aylesbury is undoubtedly the best. The crossing does away with the rather loose skin of the Pekin and the keel of the Aylesbury, giving a bird of good weight and with a deep, broad breast. Weight in ducks is not everything, some of the very heavy birds being decidedly coarse. The weight preferred for export is from 7 lb. to 9 lb. per pair dressed. Of course, ducks must be matured quickly, kept growing all the time, and topped up for market as soon as they are fit. Water is not required, except for drinking. A free range, with plenty of greenstuff, and a good supply of animal food are important factors if success is to be attained. I find that Indian Runners amply sustain their reputation as far as laying goes. My birds have averaged a shade over 200 eggs apiece during the past twelve months. Ducks and fowls should on no account be run together if successful results are wished.

For egg-production, small flocks of not more than fifty give the best results For breeding, the number of hens allowed to each rooster depends greatly on the breed and vitality of the male. From eight to twelve hens may be allowed to each rooster, according to breed. If the roosters agree, and there are no reasons for special mating, two or three may be allowed to run with a suitable number of hens.

I believe in a plain lean-to house with an easterly aspect, well sheltered at the west. For fifty hens, it would require to be about 17 × 9 feet. After trying several of the patent roofing materials, I must say that I prefer iron. It certainly gets hot at mid-day in the summer, but it cools down just as fast at night. It may be removed and re-erected without damage, and is practically indestructible.

The breeding pens should be as large as the space at one's disposal will permit. For, say, a dozen hens and a rooster, 32 × 18 feet should be the minimum.

Taken right through, the man on a small scale has a great advantage over the big breeder, as above a certain point expenses begin to mount up out of all proportion. When labour has to be employed, it soons runs away with the profits. The difficulty of procuring really reliable help is greater than anyone would imagine.

The first secret of success in poultry-keeping is absolute cleanliness. If the birds are kept in good health, half the trouble is over. This can only be done by the strictest attention to cleanliness, proper housing, and correct feeding. I feed in the morning a warm mash of 1 part of bran, 2 parts of pollard, with about 10 per cent. of animal food. The latter is absolutely necessary for successful egg-production. At night my birds have grain, either wheat or maize. Grit and shell are constantly before them, and plenty of green feed is given every day. Green lucerne in summer and lettuce during the colder months are almost always procurable.

For hatching, I prefer an incubator to hens. It is more reliable, less trouble, and gives better results. Then it is so much more profitable. Let me explain what I mean. It will take ten hens to take charge of 120 eggs. Each hen will lose at least three months of the best time of her life, when she should be busy laying. She should produce 2s. worth of eggs a month, or 6s. worth in the three months; that would make £3 worth for the ten hens. Now, the cost of running a machine of the same capacity would be from 1s. to 2s., according to the make. See? Again, hens require so much attention. They must be shepherded back to their nests; they quarrel and break the eggs; and so much provision has to be made for the chicks after hatching. Anyone who has enough eggs to run a 50-egg machine can do so at a profit; anything smaller is only a toy, and should be avoided.

It is useless to attempt to run an incubator without having a proper brooder. Homemade brooders are seldom a success. For the first couple of days after hatching the temperature should be kept at 90 degrees; after that it should be gradually reduced to about 80 degrees, and at the end of three weeks to 70 degrees. If the outside temperature is very low, care must be taken that the chicks do not get a chill.

I find that the best feed for chickens is oatmeal or rolled oats for the first week; after that I use chicken feed, a specially blended mixture of suitable grains. Fine grit and green feed should be available from birth, nine-tenths of the mortality among chickens being the result of unsuitable feeding.

I would advise any beginner to go in for one pure breed, and stick to that. Get good stock from a first-class laying strain, attend every show, and learn all that there is to know about your own variety. A frequent mistake among novices is to sell the best of their young stock. It is better to overbuy than to oversell.

I find little difficulty in sending eggs by post. Breakages are extremely rare, and the shaking in transit does not seem to affect the fertility. In the carriage of birds the railway authorities are most careful and obliging. I have never lost a bird in transit through neglect.

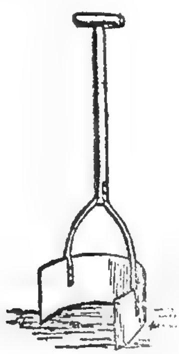
I find that advertising is the best way of disposing of eggs or stock. Say exactly what you have to sell, and what you want for it, and you will not be kept waiting long for replies.

I do not advise anyone without special experience to go in for either geese or turkeys. The latter do not seem to thrive on the coastal side of Laidley. On the Downs they might be a little more profitable, but the market is at present too uncertain. Children should be taught to take an interest in poultry. It is an education in itself to them to see the little chicks hatching, to watch them growing up, and to feed and care for the grown birds. Many a man I know has become a fancier through buying a few fowls for his little boys or girls.

The Orchard.

PRUNING STRAWBERRIES.

It would be well for amateur fruitgrowers if they would take the advice of the many practical men who are only too willing to let others know what their long experience has taught them in the way of managing fruit trees and small fruits before and after planting and during and after the fruiting season. Let us consider the strawberry plant. Hundreds of people plant a few dozen plants of the very best and most expensive kinds in their gardens, and many complain that they bear very few, if any, berries, and declare they have been swindled by the seller, when really it is their own fault. "Think I don't know how to plant a strawberry plant!" says the lady or gentleman amateur, and straightway he takes it, just as it was rooted out from a friend's garden, makes a hole, jams in the roots in a ball, squeezes the earth hard round it, and—"There you are," he says; "wait till July, and I'll give you better fruit than you can buy at the shops." July comes round, but somehow blossoms are few and fruit still less. Then he says naughty things about his friend's plants. Now, this disappointment can be avoided by listening to and acting upon the advice of the man who makes a profession of strawberry-growing. Some years ago we gave in this *Journal* an illustration of a very simple device for pruning strawberries. The amateur has heard of pruning peach and other trees, but strawberries have no branches, so how can they be pruned? This is what Mr. A. Despeissis told us long ago. Mr. Despeissis is the Horticultural and Viticultural Expert of Western Australia. He says:—"Pruning the strawberry consists in pruning the roots at planting-time, so as to favour the growth of the fibrous roots which will feed the plant, and, later on, in cutting all runners before the fruiting season, and as soon as they make their appearance. Unless this is done, the fruiting of the plant will be seriously checked. Even after the fruiting some growers will remove the runners, and only leave them on if young plants are required. In fact, treat all runners as weeds the first season."



We here reproduce the illustration referred to. The crescent blade is of such a diameter that it will encircle one side of a strawberry plant, and may be made with an arc of about 9 inches. This appliance is pushed down on one side of a plant, and then on the other side, thus cutting all runners spreading around. Where the ground is moist, the leaves of the strawberry plants should be mowed clean off in the winter, then gathered up with a rake and burnt. This checks the spread of the leaf-spot disease. The same purpose is at times attained by spraying the beds with a solution of sulphate of iron.

THE GUAVA-TREE A PEST.

For many years the guava has been considered as one of our useful fruit trees, and, owing to the ease with which they are grown and the little care needed to cultivate them, they have been planted on farms and in orchards all over the State. In consequence of the rapid spread of the most common variety, some fear has been expressed amongst fruitgrowers that they might become a serious pest as a harbour for the fruit fly. An interesting article in the *Journal d'Agriculture Tropicale*, Paris, from the pen of M. Paul des Grottes, on this subject, is, therefore, very timely. Mons. des Grottes says:—

The introduction of new plants into our colonies demands much circumspection and careful preliminary study, for whilst many are useful others are noxious. . . . Amongst the latter I place the guavas. There are five delicate varieties which are cultivated with great care in the colonial orchards, such as the pear guava, the strawberry guava, the beautiful cayenne guava, &c. These cannot be too extensively propagated, as they figure honourably amongst the best fruits of the colonies.

But I wish to speak here of the common guava, which grows wild in the Antilles, and which is found in most tropical countries. It seems to me that it will be useful to say a few words about it, not that I would advocate its complete extermination, but to utter a warning against its propagation without control. There are certainly many things in its favour. It makes excellent preserves.

It is a useful resource for the small settler, as during several months of the year the cattle fatten on its abundant fruit. The wood of the tree is much appreciated for firewood by bakers, as it makes the best of charcoal. The forked branches are used for the frames of pack-saddles. Its leaves, rich in tannin, are useful in medicine.

But the trouble with the guava-tree is its spreading over the land on which it grows, and the difficulty of eradicating it where necessary. Wherever this plant has found a footing, it may be looked upon as a foregone conclusion that the field will be invaded and entirely covered by them. It is merely a matter of time.

Domestic animals—cattle and pigs—are the primary cause of the dissemination of the plant, by eating the fruit, the seeds of which remain intact in their droppings. These seeds germinate and grow with the greater vigour in that they root in the manure.

It is no easy matter to get rid of the guava-trees on lands which they have invaded, for, not only is the plant terribly prolific, but its roots are remarkably hard, and strike deep into the subsoil. Each root, if not grubbed out, gives birth to a new trunk. In order, therefore, entirely to eradicate the plant, the soil must be dug away round the butt to a depth of about 4 feet—a work, as will be well imagined, very expensive, especially where labour is scarce. The owner of pastoral land contents himself with repeatedly cutting down the young guava-trees, and this has to be done every three months, and more frequently still in the rainy season, whence arises a heavy tax on the value of the cattle. All land covered with guavas becomes depreciated in value, no matter how rich the soil may be.

From Mons. des Grottes' article, it will be seen that we are in great danger in Queensland from the common yellow guava, which, in spite of its otherwise good qualities, is absolutely useless to orchardists, who, as a rule, are not in want of firewood, charcoal, or material for making pack-saddles. We have evidence everywhere that the fruit, year after year, is rotten with maggots, and we have also seen how it spreads from the roots, and how it is found growing far away from orchards or gardens, the seeds, doubtless, having been carried away by quadrupeds and birds. We have not observed that the strawberry guava is propagated in like manner, and should be inclined to tolerate its presence in gardens, but to advocate a ruthless destruction of the common yellow variety, which may some day become more expensive to destroy than prickly pear, and be ten times a greater pest than lantana.

CANNING PINEAPPLES.

In the Straits Settlements large quantities of pineapples are canned and apparently in a very simple manner, which could easily be adopted here, if only on a small scale, for home consumption or for export to the Southern States.

Mr. H. N. Ridley, M.A., &c., writes on this subject in the *Agricultural Bulletin of the Straits and Federated Malay States*, writes as follows:—

The pines are here always peeled by hand, though machines for this purpose have been invented, as it is found more economical to use hand labour here where it is cheap. The peelers are Chinese. They cut the top and bottom of the pine and peel it with a knife, holding the pine in the left hand, which is covered with an India-rubber glove, to protect it from the acid action of the pine juice. The gloves have constantly to be renewed, as they are soon destroyed by use. The pines are then put in the tins, which are filled up with either water or syrup. The cores are removed previously, if required, by a tin tube which is pressed through the centre, but most pines are tinned without coring. The syrup is made of 3 catties of sugar to 1 picul of water. After the pine is put in the tin it is soldered up, and a number of tins are put on a kind of wooden raft and plunged in a tank of water heated by steam. They are boiled in this tank for from 10 minutes, in the case of the smallest tins, to 1½ hours for large tins. The biggest tins weigh 5 lb. when full. After removal from the boiling water, a puncture is made in the top of the tin with a hammer and punch, and in large tins two punctures. This is to let out the steam, and after this the holes made are resoldered and the tins plunged again into boiling water for 9 minutes. They are then labelled and packed for export.

The object of tinning without sugar is to avoid duty on sugar, and also to enable confectioners to use them for their purposes. Pineapple juice is often added in the case of pines not preserved with sugar, but the tins are often filled with plain water.

Other forms of exported pines are in slices ½-inch thick (sliced pines), and with the eyes removed (eyeless pines). Bruised pines and others are often cut into chunks or cubes. All these are tinned in the same way. Grated or jam pine is another form of export. Crystallised pines are dried in the sun, and then crystallised in sugar.

The sugar used is usually Java sugar, but Mr. Landau tells me he finds Austrian beet sugar better, on account of its colour. The cost is, however, about the same. One manufacturer states that he preserves all his pines in syrup about 30 degrees solution, using from 11 to 20 lb. of sugar to 1 cwt. of pines.

COMPARATIVE RESULTS OF SEEDLING CANES D 74 AND D 95.

A long and interesting paper by Professor R. E. Blouin on the above subject was read before the Louisiana Sugar Planters' Association on 18th February, 1904. The paper is far too long to be given in our limited space. It will be found in the *Louisiana Planter* for 20th February, 1904. The canes mentioned are compared with the Louisiana home canes (Louisiana Purple and Louisiana Striped). After exhaustive trials and analyses, seven questions were framed and sent to a large number of planters who had the canes under observation. To these, numbers of replies were received, and, as a whole, they confirmed the results obtained at the Experiment Station. Summarised, the following results are to be noted:—

D 74 is more vigorous, a more rapid grower, gives a larger tonnage, is an erect cane and believed from this to be more economical in harvesting, stubbles well, if not better than home canes, gives a larger extraction, and has a larger sugar content, yielding more sugar per ton and giving a greater tonnage per acre than home canes. The same remarks, in a lesser degree, apply to D 95.

Apiculture.

NEW BEEHIVE.

At a late meeting of the One-tree Hill Branch of the South Australian Bureau of Agriculture, Mr. F. Bowman described what he termed his "Simplicity Beehive for Langstroth Frames." The hive was made of $\frac{7}{8}$-inch American shelving, was 28 inches × $20\frac{1}{8}$ inches, and 10 inches in height. It holds 18 frames across the box. The lid is made in two parts, the front portion being 12 inches × $20\frac{1}{8}$ inches, and the back 16 inches × $20\frac{1}{8}$ inches. He found this hive possessed several advantages over the two-story hive in general use. It was more convenient for handling during the honey season, as the brood is in all cases in the frames near the door, and which are covered by the smaller portion of the lid. As the honey is stored behind the brood frames, it can be got at by removing the back part of the lid, and without disturbing the brood. This was a great advantage, as it avoids the necessity for coming into contact with most of the angry bees. If the brood combs need to be handled or moved, they can be got at by removing the front cover. This is a convenience when brood combs are wanted to build up a weak colony. With a two-story hive it would be necessary to remove all the frames and the top story to secure a frame of brood comb from the bottom part of the hive. Then, again, the frames, being side by side, were not stuck together by wax—a frequent cause of trouble in the two-story hive, resulting in bees being killed by putting in new frames. At any time they could, by removing the lid, attend to any frame or portion of the hive—an important matter when dealing with the bee moth. Then, again, if the bees require to be fed at any time, three or four frames can be removed from the back, leaving room to place the food, and without causing bees to start robbing each other. He found the bees made better progress in these hives than in the two-story hive, filling each frame before starting on the next. In the old hives, he had noticed the bees hanging down in the bottom box, until forced out for want of room, before starting in the top box. With the frames side by side, they would have been three or four combs to the good. Bees can be wintered in his hive with the best results. If the swarm is a little weak, it can be cushioned up to half the box by use of a chaff-cushion board. He had been using this kind of hive for fourteen years side by side with others, and was satisfied of its all-round superiority. Mr. Bowman explained the manufacture of his hive by means of diagrams. In reply to questions, he said the red gum gave the best-flavoured honey in that locality; whereas, where stringybark predominates, the honey was darker and not so well flavoured.

EXPORT OF RUBBER FROM CEYLON.

The rubber industry appears to be thriving in Ceylon, and plantations are increasing rapidly. The rubber from the island has always commanded the highest prices in the English market, even the so-called "scrap" bringing a good figure. In 1899, the export of rubber was 7,900 lb.; in 1901 it had risen to 9,072 lb.; in 1902, 15,602 lb. were exported; and in 1903-4, the export reached up to May, 1904, 28,779 lb.

Ceylon rubber was sold last May in public auction at highest prices yet obtained, especially the good scrap. Fine thin biscuits from Para seed, 5s. to 5s. $3\frac{1}{2}$d. per lb.; good to fine scrap, 4s. 6d. to 4s. 7d. per lb.; tone good. Two cases of "Delwita" sold at 5s. 8d. per lb.

Tropical Industries.

BY A. J. BOYD.

COTTON GINS, GINNERIES, AND OIL MILLS.

Whatever may be the area which will be placed under cotton during the next two months, it is clear that, as the crop comes off, means must be found to prepare the product for market, and for this purpose ginning establishments will be required in the various cotton-growing centres. Those who understand the cotton business know that it is of no use to plant even 20 acres of cotton unless means are at hand for ginning the crop. An area of 20 acres no doubt sounds very small, but it means, given the absence of the boll worm, at the very least, 20,000 lb. of seed cotton; and, if the experimental yields at Stanwell and Cairns fulfil their promise, 20 acres would give a return of over 40,000 lb., which would employ a saw gin with 45 saws running at 400 revolutions per minute and turning out between 300 and 400 lb. of clean lint in 8 hours per 15 saws—or, say, from 900 to 1,200 lb. of lint daily—from 12 to 16 days. Of course it would not pay anyone to establish even a one-gin ginnery for the sake of a fortnight's or month's work in the year. But where a number of farmers are growing small areas from, say, 2 to 10 acres each, the aggregate amounting to one, two, or three hundred acres, then, obviously, it would be to their advantage to combine and subscribe the necessary capital to erect ginning machinery sufficient to take off the first season's crop. As the area under cotton increases, additional gins can be procured, and, provided that sufficient engine-power is available from the outset, there will be no more expense in that direction. All that is required is extra floor space and the necessary belts, pulleys, &c., for the new gins.

THE KIND OF GIN REQUIRED

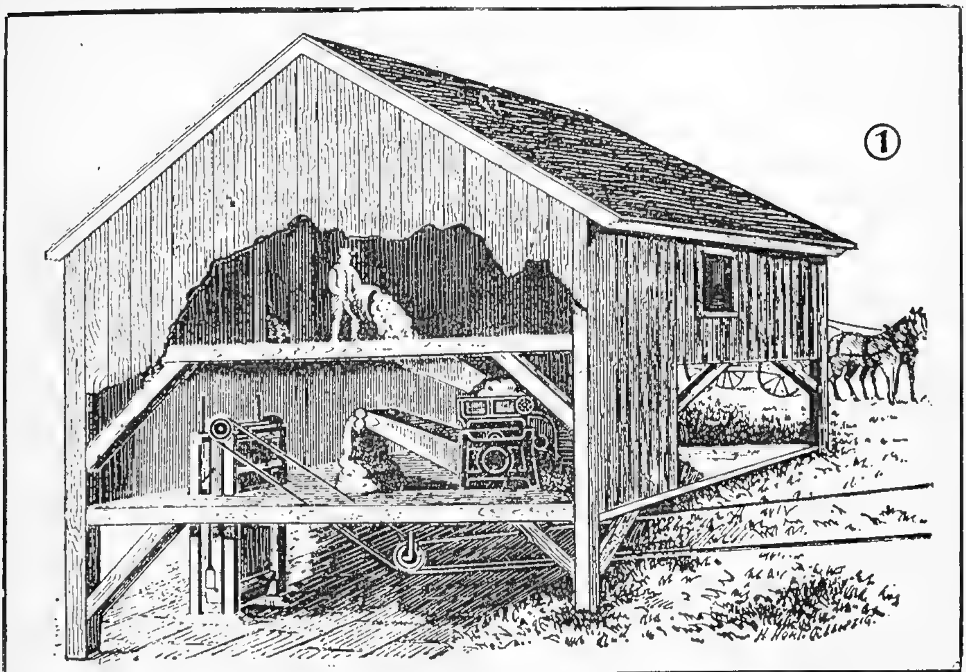
would depend largely on the class of cotton grown in the greatest quantity. Where Sea Island or Caravonica, or any fine long-staple cotton is produced, the proper machine adapted specially to this class of cotton is

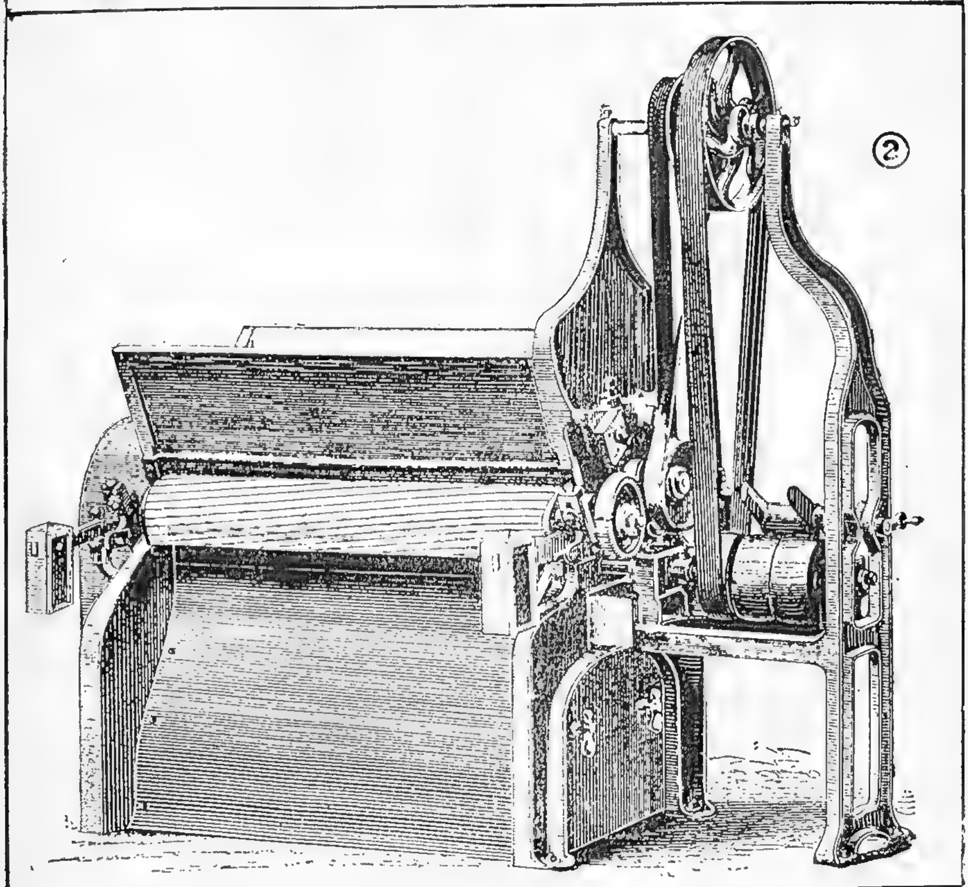
THE DOUBLE MACARTHY ROLLER GIN,

with automatic feed attachment. On no account should a saw gin be used for a long-staple cotton. There is an impression that the roller gin is not suited to Uplands or short-stapled varieties: but this is not so. The roller gin is well adapted for such staples, and it is used largely in India for cleaning the short-stapled cotton grown in that country, which clings tightly to the seed and is consequently difficult to gin. Gins of this description are manufactured at Oldham, in England, and cost £38, with 10 per cent. added for packing and delivery at Liverpool. They run at 750 revolutions per minute of the fly wheel, and turn out about 70 lb. of clean lint per hour when ginning short-stapled Indian cotton, and far more when ginning the free-seed Sea Island variety. A 2-h.p. engine or horse gear is required to drive the gin, which measures about 6 feet in length and 4 feet in width, and weighs about 14 cwt.

The advantages of this improved gin are:—It is self-feeding, so that when the seed cotton is poured into the hopper it passes through the machine without any assistance, thus enabling one man to attend to two or three gins. The rollers, which are of iron and covered with leather, are pressed against the stationary knives by means of weights, thus ensuring an even pressure. The machine can be quickly set, so as to adapt it to any class of cotton. The rollers are much longer than those of the old Macarthy gin; and neither the "doctor"

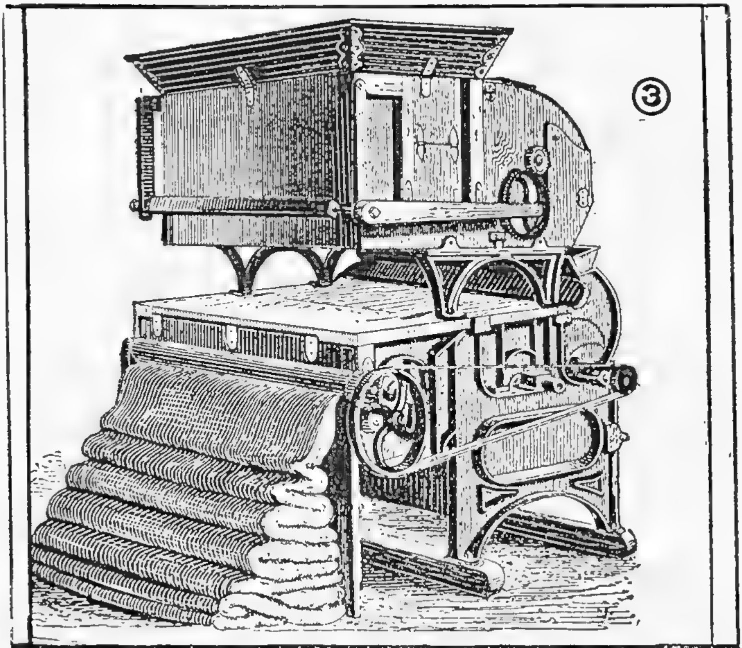
Plate I.

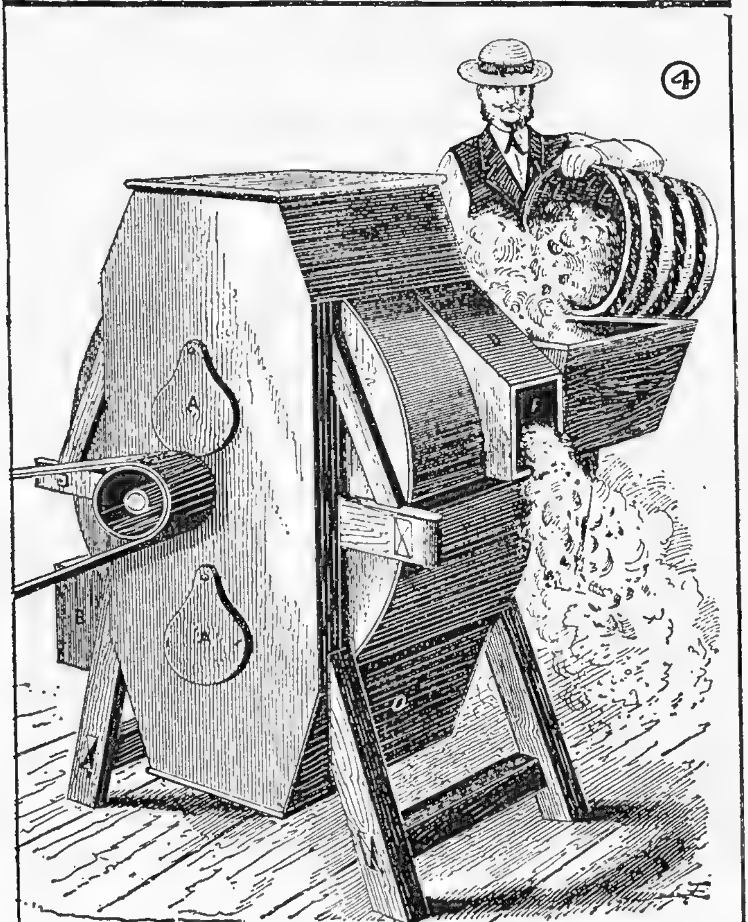




1. Gin House. 2. Macarthy Roller Gin.

Plate II.





3. Saw Gin. 4. Cotton Cleaner.

knife" nor the beater can come into contact with impurities, such as sticks, bits of string, &c., because the rollers, when encountering these, slip back and allow them to pass through.

The spiral grooves in the leather covering (usually walrus hide) are about $\frac{1}{16}$-inch deep. The leather will remain in good condition sufficiently long to clean about 125 bales of lint. Then it would require to be renewed. An extra roller should be ordered when purchasing a gin, so that work need not be interrupted whilst one roller is being re-covered. The walrus hide costs 3s. per lb. in London, and it takes 18 lb. to cover one roller. The writer once used a roller gin, which was said to have run a whole season in America, and yet the leather was quite sound, and was run for a whole season in Queensland without renewal of the covering.

Sometimes the lint will be carried round with the roller, and the "back-lashing," as it is called, if not attended to at once, will damage the knife or beater or both. To obviate the trouble, the roller should be damped slightly as it revolves.

There are two belts driving the gin from the main shaft—one to drive the roller at an average speed of 150 revolutions per minute, the other to drive the beater at about 900 revolutions per minute.

If long-stapled cotton is being ginned, care should be taken to drive the roller much slower than for Uplands, as the fibre will be sure to break if ginned quickly, and this tends to lower the value of the cotton.

Another self-feeding double action Macarthy gin costs about from £20 to £22. This only requires 1-h.p. to drive, and turns out about 30 lb. to 35 lb. of clean lint per hour. Its dimensions are $4\frac{1}{2}$ feet long and 3 feet wide; weight, about 9 cwt. (*See* Fig. 2, Plate I.)

The Saw Gin.

As its name implies, this gin is operated by means of circular saws about 12 inches in diameter. Of these there may be from 15 up to 100 fixed to the saw spindle, and the price of a saw gin is usually given at per saw. That price runs to 20s. per saw in the larger gin, and from 10s. to 13s. in the smaller, when no self-feeder or condenser is supplied. These cost separately from £5 to £10 each. The object of the condenser is to gather the cotton, and lay it in smooth folds at the back of the gin after cleaning. Without this condenser the light fleecy fibre would fly out in all directions on leaving the machine. By means of the automatic feeder the saws are supplied with just the amount of cotton they can clean perfectly without clogging. The hoppers must not be too full, neither must the saws run with nothing to do. It takes some time for a man to learn to keep the exact quantity, neither more nor less, in the hopper. The feeder saves all trouble by itself regulating the supply; 1-h.p. is required for every 15 saws. Thus a 45-saw gin would require a 3-h.p. engine and so on. There are hand saw and hand roller gins, but it never pays to clean cotton by hand—at least, not in a country where the industry is carried on by white labour, as it has been heretofore, and will be in the future, carried on in Queensland. The cheapest hand machines are dear at any price for this State. There are several very large cotton-mills in Japan, where the workmen are paid $7\frac{1}{2}$d. per day of 12 hours. (*See* Fig. 3, Plate II.)

The saws run at about 400 revolutions per minute, and about 300 lb. of clean lint may be reckoned as a day's work for 15 saws. Thus a 45-saw gin should turn out about 900 lb. of lint daily. If the machine does less than this, it is either the fault of the attendants at engine and gin, or the cotton must be very bad. Sometimes it will happen that damp cotton has to be ginned. Great care is then required in feeding the saws. Light feeding is then the rule. In a gin-house, even where only roller gins are in use, the air is full of dust and innumerable particles of cotton, which are inhaled by the attendants and bring on serious coughing fits. There are certain appliances which

minimise this unpleasantness, but it cannot be entirely avoided, and is always a source of danger from fire, as will presently be shown.

The saw teeth, although working on such soft material as cotton, must be sharpened before the ginning begins, and this may probably be not required to be done again till the end of the season, although, owing to the dishonesty of some farmers, stones, gravel, and soil are mixed with the seed cotton to increase the weight; and, if the cotton has not been "whipped" before being put through the gins, the teeth of the saws suffer, and, worse than that, the steel strikes fire on the stones, and, owing to the fine cotton dust and fluff in the air, the whole place takes fire. This once happened in the writer's gin-house. Fortunately, it was when ginning was just over for the day and the clean lint had been removed to the baling-room, so that no serious results followed.

There are various machines made for sharpening the saws, but they need not here be described. Amongst these, the best is said to be the duplex gin saw-sharpener, costing £6, which can be fixed to the saws without removing them from the gin. With this machine 100 saws a day can be sharpened. Another machine is required for the eventual gumming of the saws, also costing £6.

The gin should never be oiled whilst it is in motion. If oiling or cleaning be needed, the machine must be stopped. Cotton must be kept clean, free from dust and oil, as much as possible.

Fire.

As already stated, the atmosphere of a gin-house is primed with fine dust and particles of cotton, which, on the application of a match, will explode almost like gunpowder. In addition to this, there is the ginned and unginned cotton on the floor and in the upper story, whence it passes down shoots to the gins. All this is highly inflammable, and special precautions are taken in most gin-houses for the extinction of fire. Some are lined with galvanised iron; others have bucket, hose, or steam jets in readiness for an outbreak.

Smoking should never be allowed in any part of the gin-house, as a lighted match or spark from a pipe may start a disastrous conflagration.

For this reason also, cotton stores, baling-room, and ginning-room should be as far apart as is consistent with convenience of working, and iron or brick should be employed as much as possible instead of wood. A building constructed entirely of angle iron, with corrugated iron walls and partitions and concrete floors, is the safest. In Sir Daniel Morris's excellent paper on "Sea Island Cotton in the United States and in the West Indies," it is stated that steam pipes from the boiler enter the gin-room, and, in case of fire, all windows and doors are immediately closed and the room filled with steam. In most factories, buckets containing an osnaburg sheet soaked in water are suspended by each gin, so that, in the event of the cotton taking fire, this wet sheet can at once be thrown over the flames. At all the best factories, water under pressure is laid on, with a hose always ready for use.

Baling Presses.

A necessary adjunct of the ginnery is the baling-press. These are of several kinds by various makers—some very expensive, others the reverse. The baling-press used by the writer might be said to be of his own invention. It consisted of a stout framework, 7 feet high, boarded up on three sides; the fourth side being provided with a movable door securely bolted. A heavy wooden screw, 4 inches in diameter, worked through a framework above the body of the press. The cotton was piled into the bale secured to the upper rim of the boxed-in part; and when the bale was filled to about one-third, a stout plate, which fitted it exactly, was placed on the cotton and screwed down by two men. Then the filling and screwing went on until the cotton was piled higher than the bale, when four men screwed it down. When no more could be got into it—about 400 lb. was the limit—the top was sewn on, the side door was thrown open, and the finished bale removed. No hoops were used. When sent to the Brisbane stores for shipment, two bales were dumped into one and secured with

iron hooping. This was in the case of Uplands cotton. For Sea Island cotton, such pressure is not allowable. The lint is either tamped in by hand, or, if done by machinery, the press is provided with a plunger. When the bale is filled as before to one-third of its depth with lint, the plunger is lowered and the lint is gently pressed; the plunger is then left on the top of the cotton until the next lot is ready. When the bale is filled, it contains about 400 lb. The top is merely stoutly sewn on, and no hoops are used.

Notwithstanding the necessity for treating Sea Island cotton gently in the matters of ginning and baling, the writer once ginned a couple of bales of Sea Island, which received no different treatment to the Uplands. The cotton was forcibly screwed in. Two bales were dumped into one iron-hooped bale for shipment. When the account sales arrived from England, this cotton was shown to have sold at 2s. 6d. per lb. when Uplands was bringing 1s. 0½d.

One of the principal objects to be attained by hard pressing is the prevention of the absorption of moisture. Another is, the lessening of freight charges by the cotton being compressed into a smaller space, and thus allowing of its being shipped as dead weight instead of by measurement. Some presses are powerful enough to compress 40 lb. weight of lint into the space of a cubic foot.

Engines.

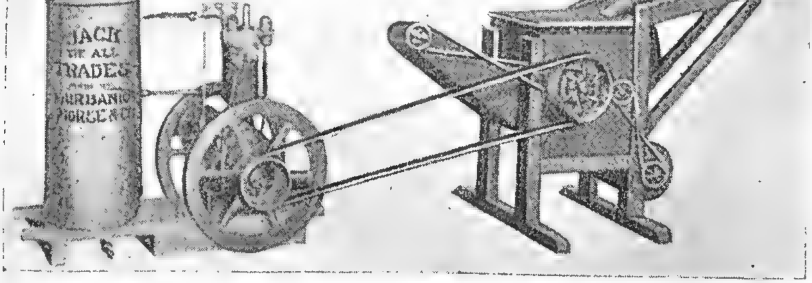
The greater the number of gins installed in a ginnery, the more powerful, and hence the more expensive, must be the motive power. In a West Indian gin-house running 8 gins, as described by Sir Daniel Morris, the motive power consists of an oil engine of 12½-h.p. This engine drives not only the gins, but also the tramping-press and cotton-carriers. The cost of such an engine, complete with pulleys, shaftings, brackets, and belting, is set down at £385.

The oil engine has a great advantage over the steam engine. It has no boiler, needs no fire, no fire-making, and no stoking; needs very little more attention than the steam engine without the boiler, needs very little water instead of a lot, and when the work is done and the engine is stopped, five minutes' attention will leave the engine in order for the next period of working.

A further convenience arises from the difference between the work of handling the petroleum and handling coal or coke. The small steam engine, with the ordinary small vertical boiler used with most of them, will require from 5 to 8 tons of coal for every ton of oil used by the oil engine. This requires handling on receipt and handling by shovelfuls into a fire-grate by hand.

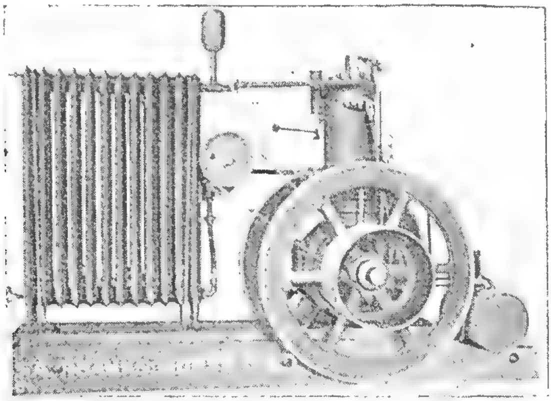
The oil is not only so many times less in weight, but in most cases the engine supplies itself from the casks, or the casks in properly arranged engine-houses are so placed that the oil runs without any attention to the supply reservoir.

The accompanying illustrations show an excellent powerful little engine, called "The Jack of All Trades," which is made in all sizes, and is well



"Jack of All Trades" Engine Driving Corn-sheller.

adapted for running cotton gins or sisal hemp scutching-machines. The prices range from £50 for 2-h.p. to any power desired up to 150-h.p. When worked



COOLING APPARATUS, "JACK OF ALL TRADES" ENGINE.

with crude oil, an additional efficiency of 20 per cent. is possible over that of kerosene. The agent for these engines is Mr. R. S. Papprill, 329 Queen street, Brisbane.

Such a factory, including buildings and all accessories and contingencies, would cost £2,435, and would be equal to dealing with a crop of seed cotton produced on from 2,000 to 3,000 acres. That is to say, that from 2,000,000 to 3,500,000 lb. of seed cotton could be put through the 8 gins working from three to five months in the year.

A smaller factory to deal with the seed cotton produced on from 800 to 1,000 acres might be installed for less than one-half that amount. Indeed, in Queensland, where elaborate buildings have never been required, an expenditure of £600 should be sufficient to deal with the crop of from 400 to 500 acres.

COST OF GINNING.

The cost of ginning with a 50-saw gin, which can get through 5 cwt. of seed cotton per hour, was reckoned, at the Ipswich Cotton Mill, at 5s. per hour or 1s. per cwt. of seed cotton in this State, when cotton was largely grown some years ago. Generally, a charge of ¼d. per lb. of seed cotton would repay the factory when the seed is returned to the grower, or 1½d. to 2d. per lb. for clean lint. Should, however, the cotton be dirty when delivered to the factory, it would require to be "whipped"; and for this a charge of 1s. per 100 lb. would be made by the factory. In the United States some factories gin cotton for the seed alone. Such factories are, however, either run in connection with oil-mills or have special facilities for disposing of the seed.

VALUE AND DISPOSAL OF THE SEED.

In our Queensland ginneries there will be two kinds of seed to be dealt with—viz., the woolly and the clean black seed. Both contain a considerable quantity of oil, amounting to about 45 gallons of crude oil to the ton of seed. The seed is liable to deterioration by keeping. It is, therefore, advisable to treat it for oil-extraction as soon as possible after ginning.

For oil-extraction the seed must undergo several processes. First, it goes to the "boll-screen," where all large foreign substances, such as bolls, sticks, stones, &c., are removed. Next the seed passes to a finer screen, where finer particles and sand are removed. From this screen it goes to the blower, where all dust is removed, and the seed is blown over magnetic plates, which seize upon and hold fast all or any bits of iron which may have been brought from the gin-house.

Uplands cotton has a woolly seed; short fibres of cotton cling to the seed, and these have to be removed by the "linters"—a large saw gin which can work off a ton of seed per hour. All the fibre is perfectly removed, and, under the name of "linters," is sold for making hats and cheap cloth at about 3s. per cwt.

The seed, being perfectly clean, passes into the hullers, which consist of two consecutive cylinders—the outer one stationary, the inner one revolving at the rate of 850 revolutions per minute. Both these cylinders are provided with knives, which cut the hulls, and allow the kernels (or "meats") to fall out. From this machine, both hulls and meats pass to a revolving screw, where the meats drop through, and the hulls are retained, to be afterwards ground up for cattle food or used for fuel, manure, or paper-making.

Now the clean kernels are ready to be pressed for oil-extraction. They are first crushed into a mass of thin flakes by heavy iron rollers. Thence this mass is conveyed to steam-jacketed kettles. Here it is heated for 20 or 30 minutes, the water being driven off and the oil left more fluid. Lastly, the meats are shaped into cakes in a machine called the "former," and either wrapped in camel's-hair cloth or placed on shallow steel frames and taken to the hydraulic press, where they are subjected to a pressure of from 3,000 lb. to 4,000 lb. per square inch. The crude oil runs from the press to the settling tanks, and the cake, solid as a board, is stripped, weighed, and stacked to dry, afterwards being broken into lumps and ground into cotton-seed meal. The yield of crude oil is about 45 gallons per ton of seed. The value of the crude oil is at present £16 15s. per ton, and of refined oil £18 5s. to £20 5s. per ton.

The oil cake (decorticated seed) is worth about £7 per ton (undecorticated, £4 15s. per ton). The cotton seed itself is worth in the British market about £6 per ton, but it is very bulky, 1 ton being equal to 38 cubic feet. It is questionable whether it would pay farmers to retain the cotton seed and ship it to the old country. They would probably find it to their advantage to sell it to the ginnery at something like £1 to £1 5s. per ton.

To keep a small central oil factory employed for about three months in the year, it would require the produce of an area of 6,000 acres of cotton. In the United States of America, owing to want of mills, only 54 per cent. of the cotton seed is utilised; but as many as 100 new mills are being erected each year in the cotton districts, and the annual output of oil is increasing at the rate of about 100,000 barrels. The gins and oil-mills are all in the cotton fields.

The oil loses about 11 per cent. of its volume in the refining process. The American output is 2,000,000 barrels per annum, worth 20 dollars (£4) per barrel.

Buildings.

The buildings required for a ginning establishment may be of a highly finished and expensive kind, or they may be of such modest construction as is compatible with usefulness.

An approximate estimate of the cost of a ginning-house in the West Indies is included in Sir Daniel Morris's paper before alluded to, which was published in the *West Indian Bulletin*, Vol. IV., No. 4, 1904. The factory is a three-storied building, 100 feet long, 27 feet wide, and 26 feet to the eaves of the roof. A basement floor is sunk 3 feet below the surface of the ground, and a 12-foot veranda is on the windward side. The engine-house forms a separate building at one end. The cost of this building, for framing, boarding, roofing, labour and materials, is set down at £1,000. The foundation, cement, brick and stone work, including engine-room and a solid masonry wall for fixing gins, &c., add £150 to the cost; or a total of £1,150 for the buildings alone. The cost of machinery—including a 12½-h.p. engine and accessories, 8 gins (£200), tramping-press, carriers, and contingencies—comes to £1,285; or a total of £2,435 for the establishment. Such a plant would suffice for 3,000 acres.

The largest area planted in any one year in Queensland was 14,674 acres, in 1870; and the quantity of lint exported in that year was 1,630,755 lb. In the following year, 1,712 acres less were under cultivation; but 2,602,100 lb. of cotton were exported. The former averaged 10¾d. per lb., and the latter 7½d. per lb., in the London market. This is, however, by the way. What I wish to show is that, if that 14,000 acres of cotton had all been grown in one large centre, two such factories could gin the produce in the course of the year, running all the time.

But cotton will be grown in Queensland as it was in former years—*i.e.*, in several districts far apart; and during the next year or two there will probably not be 1,000 acres in any one centre, although there may be an aggregate in time of 20,000 or even 30,000 acres should the price of cotton not fall below 5½d. or 6d. per lb.

The necessary buildings and machinery will, at the outset, therefore, be of no large extent.

At first, a two-storied building would not be needed. A room, 40 feet long by 20 wide, would be ample for the accommodation of two gins and a baling-press. A weather-proof cotton-store and an engine-room would complete the outfit. The cost of such buildings need not exceed £200. The gins would cost about £30 each; oil engine, £100; press, £25 to £30. Thus £400 should be ample to start with. The buildings erected by the writer only cost about £80, and proved ample for the large quantities of cotton purchased from the neighbouring farmers. Fire being so much to be apprehended, the cotton-store for seed cotton awaiting ginning, and the store for baled lint, should be, as far as possible, isolated from the engine-room.

In the United States, gin-houses are, in many cases, situated on the slope of a hill, by which situation a considerable amount of hand labour is saved. The building on the higher side is of one story, but two-storied on the lower side. The seed cotton is brought to what I will call the back door, and is emptied on to the floor of the second story. Hence it is conveyed by hand or carrier to a cleaning machine (*see* Fig. 4, Plate II.), from which it slips automatically into the shoots which open over the cotton gins situated below. The cotton, as it leaves the condenser, is carried, either by hand or by a carrier worked by the engine or horse-gear or whatever power is employed, to the baling-press, which should also be worked by engine-power. The pressed bales are passed out on to a platform outside the building, whence they can be loaded into wagons drawn up alongside.

I reproduce here an illustration of a simple cotton ginnery, taken from Dr. H. Semler's excellent work on "Tropical Agriculture." (*See* Fig. 1, Plate I.)

It should be borne in mind that heavy expenditure on factory buildings is not at all necessary. Consider the number and size of the machines required to work off a 500-acre cotton crop. Two cotton gins, each 6 feet long and 4 feet wide and each weighing about 14 cwt.; one cleaning machine in the upper story, weighing about 300 lb.; and a baling-press below. Outside, in a separate shed, is the engine. If a horse-gear is used or a water wheel, no separate shed is needed. A cotton-store of galvanised iron need not be a costly affair.

I now come to another matter which will certainly claim the attention of ginnery owners in a couple of years' time.

The longer machinery can be kept at work during the year, the less will be its cost. Sugar machinery is idle for six or eight months of the year. That is to say, that the capital sunk in it is lying unproductive during the idle time. Cotton gins will probably work from March to August in this State, provided that the raw material is forthcoming. Then must ensue six months of idleness, during which the factory earns nothing; and even the smartest hands have to be dispensed with till next season.

There is, however, a new product, which has lately been attracting much attention, and of which some thousands of plants have been planted. This

product is Sisal Hemp. The fibre from its leaves is extracted by machinery, and every cotton ginnery could have installed a couple of the machines called "Grattes" and "Raspadors," which cost from £16 to £30 each, ready to go to work at the sisal crop when the cotton season is over. The engine and baling-press would be required, so that only the cotton gins and cleaner would be idle. Seeing that the sisal leaves may be cut at any time of the year, the factory could be kept going all the year round with these two industries.

If an oil-mill be added, additional profits would be made by the ginnery.

Fourcroya Gigantea, 6 Years Old.

SISAL HEMP.

Whilst we are here considering the advisability of beginning the sisal hemp industry, other British colonies are moving rapidly in the same direction. The *Rhodesian Agricultural Journal* is just now publishing a series of articles on "Fibre Plants of Commercial Value." In India, *Planting Opinion*, published at Bangalore, is also drawing attention to the great value of this fibre, and last May devoted several columns to the reproduction of an article which first appeared in this *Journal*.

The Rhodesian article reads as follows:—

Agave Americana.

The immense and growing demand for cheap textile materials has led to the exploitation of many new fibre-bearing plants, among the most important of which comes the agave, or American aloe.

The plant was originally a native of Central America, and chiefly of Mexico, but has now been widely acclimatised in most tropical, sub-tropical, and temperate countries.

Though botanically distinct from the true aloe, like the latter it consists of crowded whorls of long rigid leaves, more or less spirally arranged on a short stem, which, in most cases, rarely rises much above the ground level. The margins are smooth or armed with sharp prickles, and the leaf ends in a long and hardened point.

The plant takes several years to reach the flowering stage, which, under unfavourable circumstances, may be retarded from ten to fifty years, accounting for the popular name of Century Plant. When about to flower, an axis is developed from the centre of the rosette of leaves, which grows at the rate of from 5 to 10 inches a day, and often attains the height of 20, 30, or even 40 feet. After flowering and seeding, the plant dies, but off-shoots spring up from the ground, and a continuous row of agaves may thus be formed.

In earlier days it was the sap that was regarded by the Mexicans as the most important product of the agave, from which were manufactured vast quantities of the pulque beer of the Spaniards, and by distillation a kind of brandy known as Mexical. Though some 50,000,000 bottles of these beverages are still introduced annually into the city of Mexico, this trade is giving way to a very profitable industry in the export of fibre. For cordage especially the latter is held in high repute, and manufacturers assert that the fibre imported into England from America improves every year. It is composed of long filaments, white, brilliant, and readily separated by friction without danger to the fibre. It takes colour freely and easily. It is light, contracts under water rapidly, and becomes fixed, after which it bears changes in humidity even more severe than can be resisted by the best hemp. In London the aloe fibre generally fetches from £35 to £40 a ton.

As a consequence of its power to flourish under the most diverse circumstances, and on soil that has little or no value for other agricultural purposes, the cultivation of the agave has rapidly extended from the original home of the industry at Yucatan, Mexico, to the West Indies, Southern Europe, India, and Australia. Several varieties have been distinguished, suited to particular situations or furnishing fibre of a special character. Much confusion of terminology exists, but the following principal types may be distinguished:—(1) Agave wislizeni, with short broad leaves, found in the mountains of Western Texas; (2) the Tequila, with large fleshy base, bearing numerous long slender leaves; (3) the true Sisal Agave *(Agave sisalana)* of Yucatan, with an elongated woody stem; and (4) the huge Pulque Maguey, the giant of the group, found on the Mexican tableland, with huge fleshy leaves, sometimes 9 feet long and weighing over 100 lb. each. The best fibre is produced from the sisal agave, though the pulque furnishes a beautiful silky thread, which is woven by the Mexicans into a soft, delicate fabric. Both of these varieties should do well in suitable soil on the Rhodesian plateau. This should be gravelly or stony, and contain a good percentage of lime. The best fibre-producing agaves grow in districts where the geological formation is wholly limestone, and in places where apparently there is not sufficient soil to support life in the plant. If the plantation be made in low ground or hollows, it is necessary to make ridges 12 to 18 inches high, the plant being very partial to a light dry soil, while a damp or water-logged soil is death to it. No manure is required, nor is it necessary to cultivate the ground, as weeds, grass, &c., do not interfere with its growth. It may be raised from seed, but in this case seven to eight years must elapse before cutting can commence, but by employing off-shoots this need only be some three or four years from laying out the plantation. The suckers should be dried for a couple of days before planting out, to prevent their rotting, after which plant in rows 10 feet apart, with 5 or 6 feet spacing in the rows. The leaves should not be cut before the plant is three or four years old, as before this the fibre is weak and not fit for manufacture. The annual output per acre

from the fourth to the twelfth year is generally stated as about 40 to 70 tons of green leaf, yielding about 1½ tons of fibre. Several excellent and inexpensive machines for the separation of the fibre, with a capacity of some 3,000 lb. per diem, have been put upon the market, which are generally driven by small oil engines.

As the chief part of the expenditure is for motive power, the fibre industry could be profitably combined with general agriculture, and the engine employed for this work when not required for other operations.

The length of the fibre varies from 3 to 7 feet, and the commercial article is white to straw white. The short fibres have been carded and spun, while the waste is excellent material for the manufacture of coarse paper. As the plant is exceedingly hardy, prolific, and will grow in arid and stony wastes where scarcely any other plant can live, and as its cultivation costs but little, we cannot go far wrong in taking up what has proved a most profitable industry in other countries enjoying similar climatic conditions to those found in Southern Rhodesia.—Editor.

SISAL HEMP PRICES.

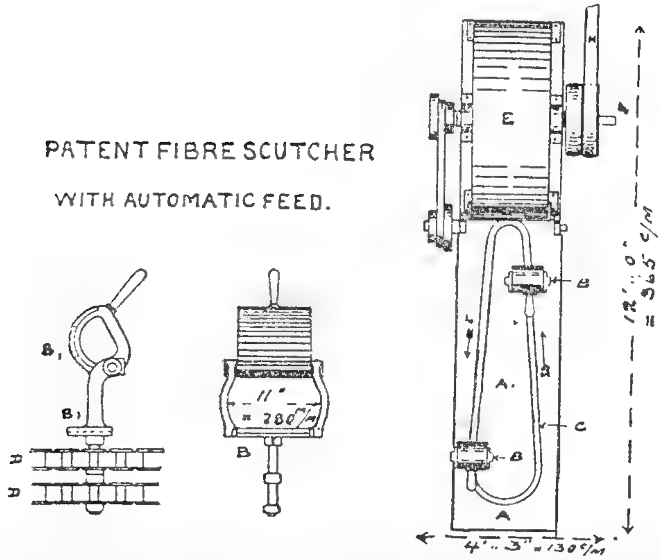
The constantly increasing demand for sisal hemp of late years has resulted in a constantly correspondingly increasing price. According to a report furnished by Messrs. Ide and Christie, the well-known fibre-brokers of London, the average prices per ton of sisal hemp during the last seven years have been as follows:—1897, £16 6s. 8d.; 1898, £27 18s. 4d.; 1899, £34 4s. 2d.; 1900, £35 8s. 4d.; 1901, £32 11s. 8d.; 1902, £43 1s. 8d.; 1903, £36 6s. 8d. A later market report states that a large consignment of Mexican sisal hemp was sold this year (1904) in the United States at £40 6s. 8d. per ton.

One of the most important uses to which this fibre is applied is the making of binder twine, and, if we consider the enormous areas under wheat in many parts of the world, we may cease to wonder at the great demand for sisal, which is considered the very best fibre for making binder twine. Every year sees a larger area of wheat sown in the Commonwealth of Australia. In New South Wales last season 1,561,079 acres were under wheat. In Victoria there were 2,140,936 acres; in South Australia, 1,593,830 acres; in Queensland, 138,096 acres. If we add to these the wheat areas of Western Australia, New Zealand, and Tasmania, there would probably be 350,000 acres more, or an approximate total of about 6,000,000 acres. Although strippers are used to a large extent, yet thousands of reapers and binders are at work at harvest-time, and the consumption of binder twine, which amounts to from 2½ to 3 lb. per acre, or, in such a season as that of 1903-4, to 4 lb. per acre, is enormous. If all this had been cut with the reaper and binder, the total cost of the twine at 7d. per lb., duty paid, would have amounted to £525,000. The raw material required would have amounted to 9,000 tons, of a value, at £35 per ton, of £305,000, every penny of which would have gone into farmers' pockets had they gone in for sisal hemp planting only six years ago. In addition to the binders already in the Commonwealth before the harvest of 1903, there were 8,000 sold, and if the coming harvest is a favourable one some thousands more will be required. Taking the enormous wheat areas of the world and the production of sisal hemp at 82,000 tons, it will be seen that there is a splendid opening for a very large trade in sisal hemp.

SISAL FIBRE SCUTCHING MACHINES.

THE BARRACLOUGH PATENT "SIMPLEX" MACHINE.

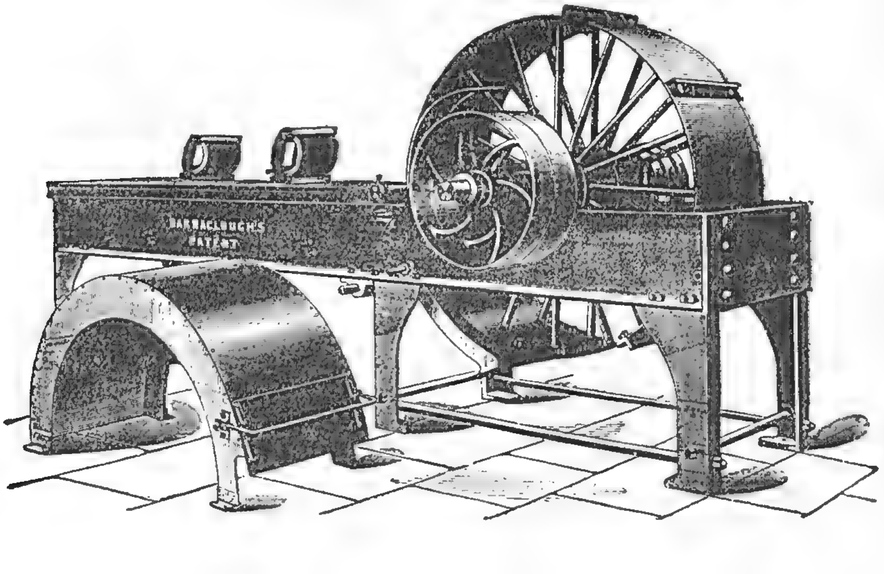
The scutching part of this machine consists of a wrought-iron drum 50 inches in diameter and 18 inches wide, mounted on a steel shaft. On the outside circumference of the drum are fixed gun-metal scrapers and brushes. The longest leaves can be treated without fear of the fibres lapping or sticking to the drum, neither can the machine become clogged by the non-fibrous part of the leaves.



In front of the scutching-drum is the oblong iron feed-table containing two side grooves connected at each end by semi-circular grooves. Underneath this feed-table (*see* plan of machine) are two endless chains D, one above the other, which work on their edge—viz., with the links vertical. To these chains, and projecting above the feed-table, are fixed two or more leaf-holders B, with patent grippers B1. These holders travel along one side of the table towards the drum, as shown by the arrow in the plan, and thus feed the leaves into the machine, pass round the groove close to the drum, and travel back along the other side of the table, drawing out the scutched fibre, the whole machine being constantly in motion.

The scutching-drum is furnished with a cover to confine the current of air and to prevent the workmen being bespattered with the non-fibrous matter produced during the extraction of the fibre. Immediately in front of the scutching-drum, and between it and the table, is fixed the beater-bar, which is of round steel held in position by set screws.

When working the machine a stream of water may be directed on the fibre immediately below the beater-bar, to wash away the non-fibrous parts adhering to the fibres after they have passed the beaters.



In the foregoing diagram A is the feed-table; B, the leaf-holder; B1, the grippers; C, the slot under which the endless chain works; D, the endless chain; E, the scutching-drum with cover on. One or more holders may be used. The holders are 11 inches wide, so that several narrow leaves can be inserted simultaneously in each holder.

The gripper is an important element. It can be instantaneously released or put in action with a slight lift of the hand. The grip is most tenacious. The more the leaf is pulled at by the scrapers, the stronger is the grip. The grippers so regulate the motion of the leaf that no part is under-scutched by too quick a feed nor over-scutched by too slow a feed. Under-scutching means not thoroughly cleaning the fibre of extraneous matter; over-scutching means cutting and damaging the fibre and producing waste. The average speed of the drum should be 280 revolutions per minute. The leaf-holder then travels at 6, 9, or 13 feet per minute, according as the drum speed is accelerated.

The leaves are placed with their thick ends or butts in the holders. When scutched the butt ends, 4 inches to 6 inches long, remain unscutched, and are chopped off. This is no real loss of fibre because, usually, the fibre in the butt ends is coarse, often discoloured, and of inferior quality, and would detract from the quality of the fibre generally.

Mode of Working the Machine.

Each machine requires two workmen—one to feed, the other to remove the fibre.

The feeding operation is as follows:—A workman stands at each side of the table. The first one inserts the butts of the leaves in the holder and drops the gripper on them. The holder travels towards the drum, pushing the leaves before it. These enter between the beater-bar and the scutching blades, undergo the operation of scutching, and as the holder travels round the curve near the drum it begins to withdraw the fibre. When it has travelled far enough along the other side, the other workman lifts up the gripper and withdraws the fibre. Then the holder travels round to the first man, who again inserts leaves, and so the operation goes on continuously.

As the juice will corrode iron, the machine must be well washed and cleaned while running empty.

Water.

In the case of extracting fibre from some plants no water is required, but the Barraclough machines are not affected in their working by the non-use of water. Still, the great bulk of fibres need water either during extraction or for after-washing. The more water the better-looking is the fibre, and, if the water is applied during extraction, the fibre may be taken from the machine ready for drying. If water is very plentiful, from 240 to 360 gallons per hour may be advantageously used. But where water is scarce from 50 to 60 gallons per hour will be sufficient if judiciously applied by means of taps. In case of very great scarcity, the same water can be used over and over again, by allowing it to run from the machine to a tank, using means to separate the refuse from the water by strainers. Under these conditions from 150 to 200 gallons will suffice for 10 hours' work.

Drying.

In some cases, the fibre is dried by being hung on cords or wires in the open air. In moist climates, drying-sheds are necessary, and the fibre is dried not so much by intense heat as by dry air, which is admitted at one end of the house and exhausted at the other. Thus the fibre is dried naturally and retains its elasticity, flexibility, smoothness, and colour.

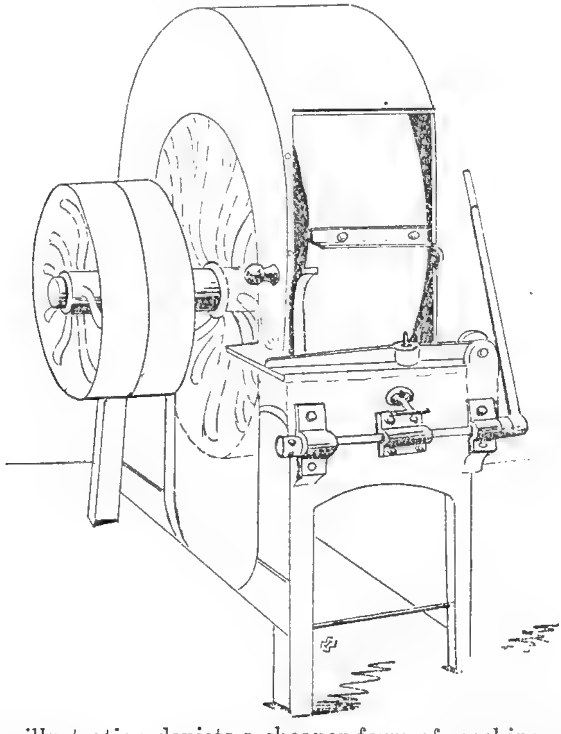
The machines will clean about 618 lb. of dry fibre per day, running for 10 hours. In the case of short leaves and using three holders the yield of dry fibre amounts to 927 lb., and with four holders to 1,236 lb.

Preparing for Market.

Sometimes a brushing-machine is used to perfect the cleaning of the fibre. This process costs from 3s. to 6s. per ton, but the brushed fibre realises the highest price in the market. After brushing and combing, the fibre is made up into bundles or hanks, varying from 2½ inches to 4 inches in diameter. They are then pressed into bales.

Cost of Machine.

The machine here described costs £32 5s. without the automatic feed attachment. With the latter the price is £83 10s. The power required is 3-h.p.



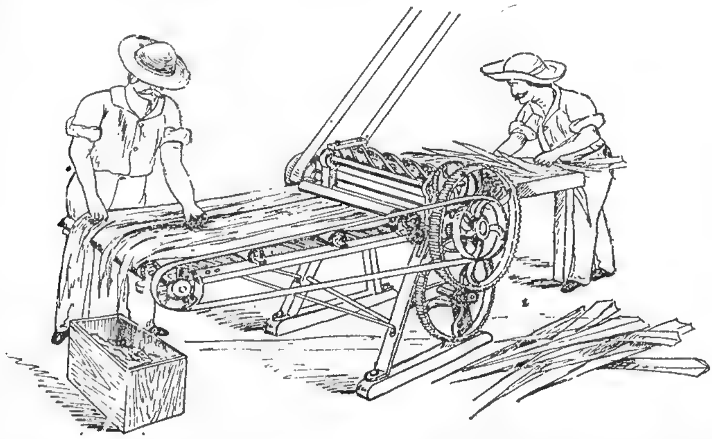
The above illustration depicts a cheaper form of machine, equally effective, but simple, handy, and especially adapted for small cultivators. It is furnished with one cast-iron cylinder, 48 inches in diameter and 14 inches wide, which revolves at about 200 revolutions per minute. The cylinder is covered in as in the former case, and is provided with 8 brass scrapers on its circumference, one-half having their surface in contact with the leaves left plain or smooth, which are called the scutching scrapers. The other half have a serrated surface, the object of the serrations being to divide the leaf or spread it out. They are usually called spreaders or dividers, because they spread the leaf out and present it more evenly to the scrapers. In front of the machine is a movable scraping block, curved to the periphery of the cylinder. It is made of iron, faced with wood, so that whilst the leaf is being scraped it rests upon the block. The distance of the block from the action of the scrapers may be regulated according to the thickness of the leaves, to ensure effective scraping without damage to the fibre.

Feeding the Machine

is done by hand. One man is needed for this purpose, to fix one end of the leaf into the apparatus while the other end is being scraped. Some degree of strength is needed to pull it out of the machine. After one end of the leaf is cleaned and withdrawn from the scrapers, the man winds the fibre of the

cleaned end round a gun-metal hook, and presents the uncleaned end of the leaf during its first treatment in the machine. The power required for driving this kind of machine is about 2 indicated horsepower.

The machine is made of three sizes, the cylinders being 48 inches in diameter, but 14, 12 and 8 inches wide respectively, the driving power needed being only 1½-h.p. for the machine with the narrow cylinder. The space occupied by them is—for the largest, 5 feet 10 inches by 4 feet 7 inches; for the smallest, 5 feet 10 inches by 4 feet 1 inch; and the total weight ranges from 17 cwt. to 13 cwt. The cost of each of the three types of machine is £39 15s., £34 10s., and £32 5s., at the English factory. They are handy machines for moving from place to place. All fibre-scutching machines dealing with fibrous leaves are constructed much on the same simple plan.



The above illustration shows a machine used for extracting the fibre of both leaves of the Agave, and of plants the fibre of which is contained in the bark of the stems. The "Gratte" is a very simple extracting machine used in Mauritius for the Fourcroya leaves, and the "Raspador," equally simple, is generally used for fibre extraction in Mexico. The cost of these machines ranges from £16 10s. to £24 10s. in those countries.

THE ISIS SUGAR DISTRICT.

As the monks of olden times in Merrie England fixed the locations of their abbeys and monasteries in the most beautiful and fertile parts of the British Isles, so it would seem that the sugar-planters of Queensland settled on the beauty spots of the State to carry on the industry. It is extremely probable, however, that the early planters had an eye to the fertility of the soil, facilities for transport, and proximity to a port rather than to picturesqueness of scenery. But the conditions which made for successful sugar-planting necessarily placed the plantations in the midst of the magnificent scrubs and well-watered undulating country near the coast. As a consequence we find that a visit to the beauty spots of Queensland, both in the North and South, takes us to the centres of activity in the sugar-growing world.

Amongst the many beautiful districts thus occupied is what is commonly known as the "Isis Scrub," about 28 miles from Bundaberg. To those who have only lately made acquaintance with this district, the name of scrub would appear to be a misnomer, for, except in the cases of one or two German farmers, whose hereditary caution has induced them (like sensible people) to preserve a few acres of standing scrub, there is nothing in the whole range of 15,000 acres, mostly covered with sugar-cane, to indicate

that once upon a time the whole of this area was covered with dense scrub and tenanted only by wallabies, dingoes, scrub turkeys, and that ubiquitous pioneer of civilisation—the timber-getter. To-day, as far as the eye can reach, and to more distant boundaries, the whole of this large piece of country is under sugar-cane and other tropical products, besides fodder grasses, farm crops, and fruit trees. Everywhere the land is considerably undulating and well drained, whilst in many places springs of clear water may be seen issuing from the ground.

In the distance to the east may be seen a portion of the high land about Pialba and even a portion of Fraser's Island. In another direction, beyond the vast stretch of canefields, rises a belt of timber—forest and scrub—and beyond that again to the west the high lands of Dawes' Range. Amidst the canefields are the houses of the planters, generally on rising ground, snugged away amidst embowering tropical shade and fruit trees, and surrounded by pretty gardens. Several large sugar-mills, miles of permanent tramlines, and loading-cranes dotted about the fields like so many old-time gallows complete the picture. The brilliantly red soil of the region, which is of volcanic origin, and is exceedingly rich and fertile, affords a pleasant contrast to the vivid green of the sugar-cane, now rapidly falling before the knives of the cutters, and the deep blue of the sky. Most of the canefields are kept scrupulously clean, and the visitor may wander for miles over the wide straight roads through the cane without encountering the wilderness of weeds with which one has become familiarised during dropping seasons in most farming districts.

Owing to the cold snap lately experienced early in July, preparations were pushed forward at all the mills to be ready, in case of need, to take off any cane which, owing to its growing in low lands, might have been nipped by frost. There are four sugar-mills in the district—the Colonial Sugar Refining Company's mill, Doolbi, Goodwood, and North Isis Central. There was another out-of-date mill at Horton, but this has been almost entirely dismantled, and apparently now serves as a refuge for the destitute or camping place for swagmen looking for work during the crushing season.

In 1898, the Isis mills crushed 250,000 tons of cane. This year's crushing will undoubtedly prove to be the best since then, although the locust plague will account for a small yield at the southern end of the scrub.

It seems remarkable that the locusts which appeared in billions in the young cane in the South Isis should not have put in an appearance in the northern portion. In the former, the cane leaves were so destroyed by them that nothing but the mid-rib of the leaf was left, and it seemed impossible for the cane ever to recover. Various means were adopted for the destruction of the pest, the most effective being the driving of the "hoppers" into shallow pits, as shown in the illustration. These pits are about 2 feet deep and 25 feet long. A strip of calico fastened to stakes is placed at both sides of the pit for about 100 yards, and then a drive is started by a line of boys, armed with small bushes, who drive the hoppers before them until they reach the pit, into which they fall, and are then easily disposed of. The result of this plague has been that the young cane lost much time in regaining strength before starting to form joints, whilst the untouched cane was rapidly adding feet to the length of crushing cane. Still, after all, there will be a fair crop, but not equal to that of the north end. Through the courtesy of Mr. Helms, manager of the Childers mill, I was taken on a trolly, in company with several other gentlemen, through the canefields of the Upper Isis. Mile after mile the little locomotive rushed through these fields, on which the cane is equal to much of the irrigated cane at Bundaberg and on the Burdekin Delta. The soil of this part of the scrub appears to be better than that of the Lower Isis; the land also is not so undulating, and, hence, is easier to work and lends itself better to transport. The value of land for sugar-growing is about £30 per acre, and, given fair seasons such as the present, a cane-farmer should be

Plate III.

FARNBRO', CHILDERS, THE RESIDENCE OF T. H. WELLS, ESQ.
FIGHTING THE GRASSHOPPER.

Plate IV.

4. Kanaka Huts, Farnbro', Childers.

5. A Cassava Field

able to make a good percentage on his outlay for land and cultivation. The Colonial Sugar Refining Company and Messrs. Young Bros., of Fairymead, Bundaberg, have large areas of land here under cane. Ten-months' old ratoons here were looking remarkably well, showing from 6 to 7 feet of crushing cane. Whilst portions of the plantations may yield as high as 40 or even 50 tons of cane per acre, the general average will be most likely somewhere in the neighbourhood of 15 tons. If, as Dr. Maxwell says, the crop this year will be measured by the sugar content, and not by the volume of cane, the content being so much superior to any of late years, then there should be a record yield on this part of the Isis at all events, especially if 8 tons of cane can be induced to yield 1 ton of sugar. If the forest land of the Isis district were worth planting, an enormous extent of additional cane would be planted; but it is, with a few exceptions, absolutely worthless except during time of drought, when this country was utilised to save the lives of thousands of sheep, which were brought on to it from the arid, grassless lands of the interior. It is quite possible, however, that these spewy, sandy lands may be found to overlie rich coalfields, in which case they will eventually prove to be more valuable than the rich sugar lands.

The tramways are all of very solid construction, with 41¼-lb. rails, and extend for many miles through the district, portable lines being used as in other sugar districts as feeders to the main lines.

At Farnbro', the property of T. H. Wells, chairman of the Childers Shire Council, where I was most hospitably entertained during my all-too-short visit to the district, is a fine plantation covering 400 acres, of which 260 acres are under cane. The homestead is very prettily situated on a knoll, whence a splendid view of the surrounding country is obtained. An orchard, banana plantation, and a large field of cassava surround three sides of the house, in front of which is a well-kept tennis lawn. On the opposite hill are the "boys'" huts, constructed of cane leaves, very comfortably fixed up inside with bunks and tables, and picturesquely situated amid patches of bananas, orange-trees, and tall sisal hemp agaves. A considerable piece of ground is allotted to them for growing whatever they please for their own consumption. I noticed that they grow a considerable quantity of tobacco and many fruits, besides sweet potatoes, corn, &c. At the time of my visit they were all away working on a new property Mr. Wells is creating in the forest land near Goodwood. It seemed very strange to see a well-kept plantation without a single working hand about; but, as the crushing season was coming on, they were all coming back to get the cane trashed and carts and all other necessaries ready for removing the crop to the mill. The carts in question are very solid constructions, specially adapted for the work of carrying the cane to the head of the tramlines. Their cost was about £10 each, exclusive of special ironwork. Each cart is provided with a small iron winch, by means of which wire slings are tightened round the load, other wire slings being laid in the cart previous to loading. On arrival at the tram trucks, the gallows-like crane before mentioned is brought into requisition. This crane consists of a stout hardwood post, some 25 feet in height and a foot in diameter, sunk in the soil like an ordinary post to a depth of 4 feet, and stayed by several wire ropes. A gib of about the same length is then attached to the base of the post in such a way that it can be swung as required. On arrival of the cart, the load, which weighs about 20 cwt., is slung to the gib, lifted bodily out, and deposited in the truck. Two such loads are put into one truck. As much as 3 tons can be lifted at one time, but the lighter load is considered more time-saving. There are several of these cranes at various points on the plantation, the gib and gearing being so arranged as to be shifted from one part to another.

On this plantation a commencement has been made with the cultivation of the *Agave rigida, var. sisalana,* the aloe from which the valuable sisal hemp is obtained. Mr. Wells practically began his experiments in this direction some nine years ago with plants obtained from the Department of Agriculture.

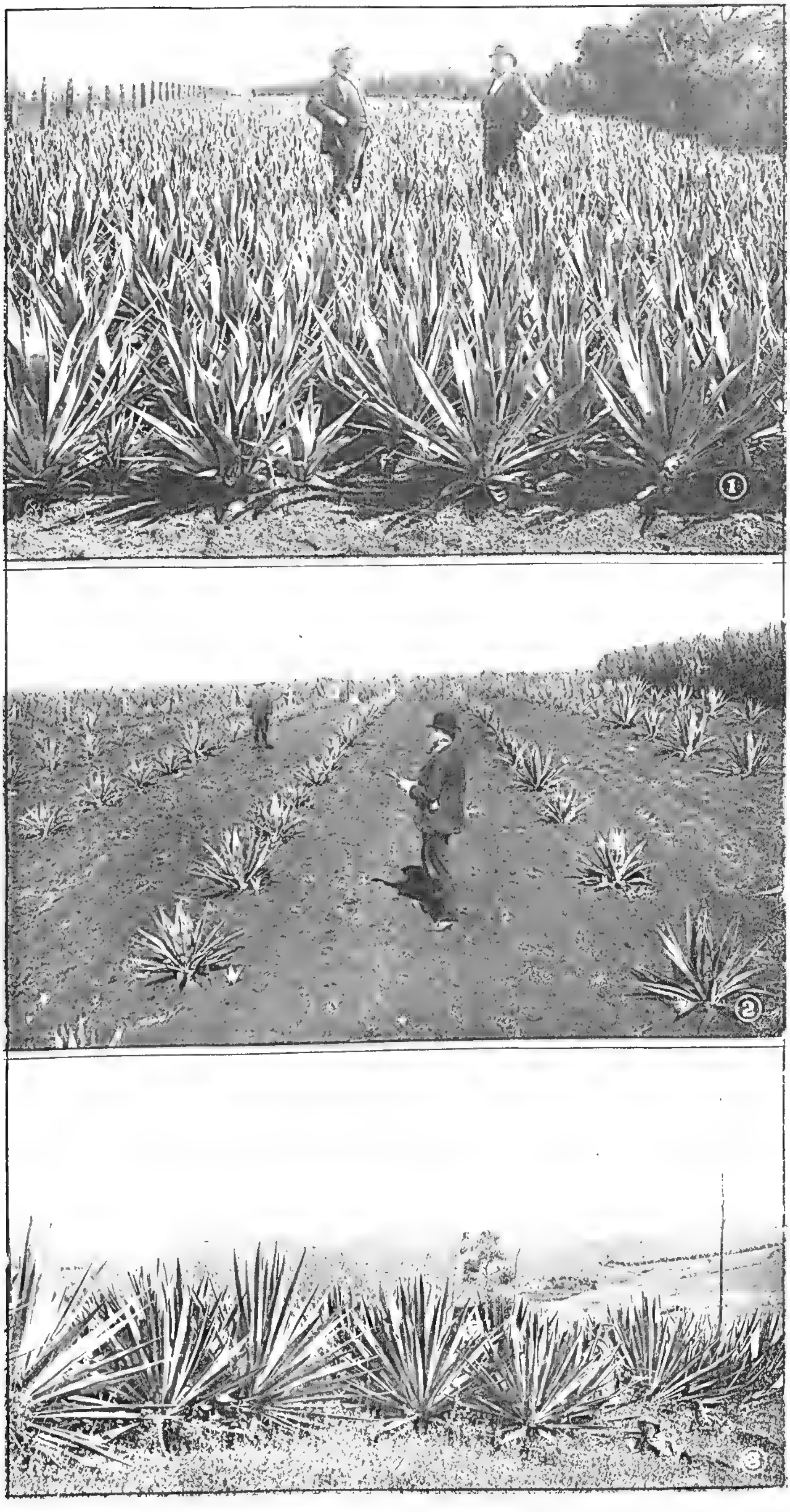
These succeeded admirably, having been planted on the rich scrub soil. The leaves run to a length of about 6 feet, and weigh over 4 lb. each. These original plants are shown in the illustration, one having been allowed to retain the flowering pole. From these many thousands of plants have been planted out. Between Farnbro' and Childers Mr. Wells has a nursery containing over 12,000 plants, or sufficient to plant over 15 acres. The first plants put into this nursery were set out in March, 1903, and the rest at intervals until 31st August. They were mere bulbils when planted out, and now have attained a height in some cases of over 2 feet after only growing for periods varying from sixteen months to ten months. It will be seen by the illustration that they are now in splendid condition for planting out in the field, in the manner shown in Plate V., Fig. 1. Some of these latter were put into their permanent places, 8½ feet apart each way, on 31st August, 1903, and consequently have only been growing for ten months. During the period they have made wonderful growth —from 18 inches to 2 feet; and they give evidence that some leaves will be ready for cutting before the conventional three years have expired. They have made this growth in spite of adverse circumstances. In the first place, the weather was continuously dry when they were being planted, and some weeks afterwards they were nearly all blown out of the ground during a gale of wind. A few plants of *Fourcroya gigantea* are set in a row alongside the sisal plants, but they have not made the same growth. The plants in the nursery were set 1 foot apart. In the barren, rocky soil of Yucatan this would, no doubt, have been a sufficient distance, but on the rich Childers soil they grow so rapidly that they already take up the whole of the space and are overlapping each other.

Mr. Wells is so satisfied with his experiments that he intends to continue planting until he has a very large area under sisal, and has, since this article was written, planted out permanently 11 acres. The average weight of the leaves is 3½ lb. already, and will certainly reach from 4 to 5 lb. This shows the great advantage the Queensland plant has over that grown on the barren, rocky soils of Yucatan and Hawaii. Of course, it is a matter for the consideration of the farmer whether he will utilise his best lands or his worst for planting sisal. If he can find a crop, such as sugar, for instance, which will give him a larger return and leave a larger net profit, then he would obviously be unwise to plant anything but sugar on his best soil.

From what has now been proved, it would seem that if sisal hemp had been planted three years ago on some of the land on which sugar-cane has been grown at a loss, the owners would to-day have been in a much better position than they are.

I have stated that cassava is now being grown at Farnbro'. Here it thrives admirably, as may be seen by the illustration of a cassava-field on Mr. Wells' plantation. (Plate IV., Fig. 5.) I cannot say what will be done with the crop, which should give a return of about 10 tons of tubers per acre, but I understand that Mr. Wells is growing this crop in conjunction with the Queensland Acclimatisation Society. The cost of production in Jamaica is set down at 8s. per ton, and the factories pay 18s. per ton for the tubers. The cost of digging and delivery to the factories adds 6s. per ton to the expenses of production, thus leaving a profit of 4s. per ton or about £2 per acre. There is no factory here for the production of cassava starch. In the United States large factories are already established, and one is now being erected at a cost of 100,000 dollars (£20,000). The Jamaica plant is small, but apparently effective. A parcel of 6 tons of tubers, worked up produced 1 ton of starch, the cassava containing about 29 per cent. of starch. The actual cost of production, including the growing of the tubers, was £6 per ton, and a high-grade starch was produced, worth anything between £15 and £20 per ton. A first-class modern plant would so reduce labour and increase the yield of starch that it would return 2 tons of starch per acre. According to this, in cassava starch we have a product that will give double the financial return per acre of sugar,

Plate V.



1. Nursery of *Agave rigida*, var. *sisalana*. 2. Plants in their Permanent Places.
3. Original Plants, 9 Years Old.

and at a cost very considerably less. It will be useful to future growers to hear what was the yield of tubers per acre on Mr. Wells' plantation, and how they were utilised. This is another of the new industries which other countries are exploiting, but which we in this State look upon with indifference.

The bananas look very healthy, but Mr. Wells is of opinion that the climate, as a rule, is too dry for them. So far, however, they look as thriving as plants of similar age at Cairns. It is a pity that a trial has not been made of *Musa textilis*, if only to prove whether the climate is against it or not. Olive-trees appear to do very well, and some fine young trees in the orchard bore fruit this season. Vines, pineapples, persimmons, oranges, and other fruit trees in the orchard show that fruit-growing in the Isis district should be attended with some success. I noticed a very wealth of the fodder grass, *Panicum muticum*, growing in gullies and vacant places where it is not convenient to grow sugar-cane. The extraordinary strong and quick growth of this grass was most remarkable. Mr. Wells vouches for the fact of its having crept along the ground at the rate of 9 feet in a week under very favourable circumstances. The cattle and horses all like it, and there is ample feed where it grows for numbers of sheep or cattle.

I only had time to visit one or two places during my short stay. Several sugar-growers told me they intended to try some sisal hemp and cotton on land which is thrown out of sugar. I think if every farmer would devote his waste land to sisal hemp he will have no cause to regret having done so. Everywhere I saw any plants growing they were thriving. One sugar-planter, Mr. Epps, was anxious to put in 7 acres of sisal, but could only obtain plants enough for 1 acre from the Department of Agriculture. He has since been offered sufficient plants for 5 acres.

There are, as a matter of fact, so many applications for plants that it cannot be long before those who wish to plant more than an acre will have to buy or import plants for themselves, and, if they are wise, they will not delay in applying for plants whilst they can be supplied by the Department.

It is surprising to note the amount of work which has been done in the Isis. The entire scrub is cleared and under cane. Mr. Wells settled here in 1893, and there is not a stump on the whole plantation; in fact, the wood question is becoming a serious one, especially for the mills, as it has to be brought from a long distance. It seems that in time coal will have to take the place of wood for domestic and other purposes.

I paid a visit to a property belonging to Mr. Wells, about 8 miles from Childers, which consists of about 100 acres of really good forest land, heavily timbered with bloodwood and gum of large size. These patches of good forest land are few and far between. About 20 hands were busy here in clearing the land by means of a strong double-tackle and a pair of horses. The surface roots of the trees are cut, and the tackle and horses do the rest. Thus the clearing goes on fairly quickly. It is intended to convert the place into a large orchard, principally of citrus fruit trees, for which the soil seems well adapted. The road we passed over to reach the place passes through most wretched country, utterly unfit for agriculture, but bearing a good crop of fine timber, which should be reserved; 200 acres within 3½ miles of Childers are, I believe, already reserved. All the available straight saplings and quantities of other timber are being removed. There is also any amount of good gravel in this direction, only a few miles from the town, which could be profitably utilised on the red-soil roads. These, although kept in admirable order in and around the town, are unpleasant to drive or ride over after a heavy shower. It is a wonder how horses keep their feet at such times in going up and down the switchback roads.

The town of Childers is as pretty as its surroundings. The main street is very broad and well kept; trees have been planted which in time will enhance the beauty of the town and conduce to the comfort of the inhabitants. A couple of years ago, a great fire occurred which entirely destroyed the principal buildings on one side of the street. This disaster was promptly remedied, and

finer buildings were erected—this time of brick instead of wood. The hotels, of which there are five, are excellent; two or three of them are quite as well built and fitted up as many in the coast towns. The shops are also tastefully arranged, and when open at night present a very brilliant appearance. There is a handsome Shire Council hall, State school, a school of arts, two churches, and many very pretty private houses surrounded by gardens. Owing to its situation, the town is well drained and very healthy. In fact, Childers may be considered as well-built and thriving an agricultural town as any existing in the State. The now fine city of Toowoomba arose from a much more humble position, and, given close settlement, variety of industries, and sufficient labour of the right kind, the capital of the Isis must take high rank among the cities and towns of Queensland.

Before I conclude, a word on irrigation may not come amiss. A casual glance over the lands of the Lower Isis will show that, owing to its configuration, it does not lend itself to irrigation by simple means such as are adopted at Fairymead and Qunaba and many other places at Bundaberg, where the land is level, and as at Mackay, Bowen, and the Burdekin. Neither the tube-well system nor the shaft-well would be of any avail here. To irrigate these lands, water would have to be lifted 250 feet at least.

Although water can be obtained almost everywhere by sinking, owing to the numerous springs, many of which did not dry up during the great drought, yet there is not sufficient for irrigation purposes. The canefields are so very undulating that no system of pumping from wells would seem to be of any use. A perfect scheme for bringing water to the canefields has been proposed, by which water would be brought by flumes and pipes from a point 24 miles distant. A good dam could be made about 4 miles from Childers, but the scheme would prove far too costly in proportion to the advantage gained, so that, for the present, nothing can be done in the direction of irrigation, and cloud water must still be depended on for the production of crops.

Since the above was written, I have paid another visit to the Isis, and found that there is great activity in preparations for the coming crushing season. The cane has made remarkable growth, and very little, if any, damage has been done by the late frosts. The cane tops are cut up on the lowest-lying lands, but everywhere else there is no sign of frost. There is thus every prospect of a good crop, very heavy in many instances. Messrs. Young Bros., of Fairymead, are sending away special trains daily of 160 tons of cane from the Isis, to be crushed at their mill at Bundaberg.

My mission to the district did not, however, embrace the sugar industry, but the establishment of a new one—the growing of sisal hemp. This has already been carried on, as above stated, on a small scale for several years, and the prospects are so good that all over the district great interest is being taken in the plant. Mr. Wells had a splendid exhibit of sisal in all its stages at the show of the Childers Pastoral, Agricultural, and Industrial Society, which was being held the day after my arrival. The show was splendidly managed, and consequently proved a great success. The secretary, Mr. A. Eastaughffe, is to be congratulated on the result of his efforts. It is not the province of this *Journal* to give a full account of any show, but I may incidentally mention that it attracted residents and visitors from most parts of the Burnett district, some 3,000 persons being on the ground each day. The presence of so many planters and farmers gave me an excellent opportunity of disseminating information on the sisal hemp agave, its cultivation, and extraction of the fibre. Mr. Wells' exhibit outside the show building, with its well-grown leaves, the bulbils, young plants, and clean fibre, formed a capital object lesson; and during the two days of the show I was enabled to advise a number of inquirers and prospective growers on the kind of soil to be preferred for a plantation, the expense of production, value of the product in the London market, &c. Many appeared to be troubled about the cost of machinery. Others fancied

that large bodies of water were required in which to ret the leaves, as in the case of jute and flax. The questions of the establishment of a central scutching mill and of the purchase and cartage of leaves were also brought up. As to the machinery, when it was explained that machinery sufficient to take off 100 acres of leaves could be installed for even less than £150, and that the leaves are not retted but at once put through the machine, many decided to devote a portion of their land to this business. It was explained that cartage of the leaves to any great distance would not be profitable. When it is considered that a well-grown leaf weighs about 4 lb., and that the yield of fibre from it is only 1½ oz., it is clear that if leaves were purchased at any distance from the mill at 1s. per cwt., and cartage had to be paid, the cost would be greater than the return, as the yield of fibre, under the favourable Queensland conditions, from 1 ton of leaves would amount to 52½ lb., worth about 18s. Obviously, the better plan would be to take the machine to the leaves. In fact, in any district where small areas of sisal hemp are grown, the crop could be taken off by a travelling machine, in the same manner as wheat is threshed by the travelling threshing machine.

Amongst the many who made inquiries about the industry was Mr. F. Buss, of Bundaberg, who now intends to plant a considerable area on his sugar plantation. This gentleman asked me if the "wallam" country between Childers and the coast would be suitable for sisal hemp-growing. From the impression I had formed of this unwholesome-looking country on a previous visit, I concluded that it was very wet or "spewey," because almost everywhere there were quantities of ti-trees growing on the white, sandy soil. Some said that there was any amount of dry land on the wallam, and that Mr. Despeisser, present manager of the Nambour Central Sugar-mill, had taken up a selection near the coast for the purpose of growing seedling sugar-canes. These proved a failure, and he then planted the land with sisal hemp. This was some years ago. I decided to go and look closer at the land, and with that view drove out and spent a couple of days on and near the coast. The result of my visit was to find that none of the sisal plants I saw were doing any good. Some which had been planted sixteen months ago were no larger than when planted. From one of these, which was about 1 foot in height, a sucker had been thrown up from a thin thread-like root running for a distance of over 2 feet from the parent plant and barely 1 inch beneath the surface. This sucker was about 3 inches high, and had six leaves on it. It was taken off and replanted, the date being noted, but I am convinced that the *Agave rigida*, var. *sisalana*, will never succeed near the coast, whatever the *Fourcroya* may do. Further from the sea and near the Gregory River, I found the country to be anything but swampy, and was informed that even in heavy rains it could be driven over without bogging the wheels. The character of the timber growing on it also showed that there was no wet subsoil. I therefore took a sample of the soil, carefully dug from the surface to the depth of a foot. This I hope to be able soon to give an analysis of. If it contains the plant food needed by the Sisal Agave—viz., lime, potash, magnesia, and phosphoric acid—then the land will be quite adapted to sisal hemp-growing. The only thing I could not get clear information about was the degree of frost experienced on this vast, level, sandy expanse. A few miles away on the coast there is no frost, or very little, and it is very probable that there would be not sufficient here to injure the plants, surrounded as they would be by sheltering timber. There is plenty of suitable country all along the banks of the Gregory and away down to the Burrum on the coast, but whether the analysis would prove its suitability is another thing. Should the analysis show that the spot whence I obtained the sample of soil is unsuitable, then the whole of the wallam here—about 60 square miles—may be condemned for sisal hemp-growing, a thing to be regretted, as the land is perfectly level for miles, and could easily, even in wet parts, be kept dry by large open drains, whilst very little clearing would be needed. The greatest trouble, to my mind, would be the abundant growth of

flowering shrubs. These are found in every direction, and nowhere, except on the Severn River, at Texas, have I seen such a wealth and variety of flowering shrubs and trees. I should think it would be ideal "bee" country. Near the coast of Hervey's Bay, between Theodolite Creek and the Burrum Heads, there is some very large timber, principally bloodwood, white gum, and Eugenias or rose-apple. This latter is generally called here the apple-tree, but this is a misnomer. It is a beautiful shade tree, and bears a large number of so-called apples, shaped like an exaggerated sodawater bottle. The casuarinas and wattles, with other acacias, grow to a very large size, especially on the Gregory, where I noticed some wattle-trees quite 2 feet in diameter and from 40 to 60 feet high. The country appears to be well watered by deep waterholes, which are, however, difficult of approach owing to the dense growth of bulrushes around them. Of grass there is very little, except in large patches, the whole of the vegetation appearing to consist of flowering shrubs. A frequent wattle on the coast is the *Acacia flavescens*, as described by the Colonial Botanist, Mr. F. M. Bailey, F.L.S., in his splendid work on the Queensland flora and in his other useful work, "Queensland Woods." It is a small tree, the young shoots clothed with a yellowish, mealy down. The leaves are very broad in the centre, as much as 3 inches, and appear like a leaf cut in half, about 6 inches long. It has sweet-smelling flowers in globular heads. The bark of this tree contains 10.20 per cent. of tannin. The wood is brown, and very prettily marked, close-grained, and hard.

I have purposely described this country rather minutely, because the character of soil and subsoil and other physical qualities may be fairly well judged of by its flora. Coal is known to underlie probably the whole of this area.

Another matter which calls for attention is the cypress pine forest. This covers an area of about 8 miles along the coast of this portion of Hervey's Bay by about 2 miles in depth. Here there are numbers of cypress pines, generally clustered thickly together, from the young sapling to trees 18 inches or more in diameter. If the whole of the cypress pine country were reserved as a forest, the tree which now reaches maturity only to die off would be perpetuated. A resident of the district made a very good suggestion, which was, that the land should be cut up into blocks, each with a sea-frontage, and leased at a peppercorn rent to anyone who wishes to build a seaside residence, on condition that the young trees be cared for. Several portions of this land have been sold to residents of Childers, and several neat cottages have been built as summer resorts. The beach is even superior to that between Burleigh Head and the Tweed Heads. The distance from Childers is about 24 miles, and from Goodwood Railway Station, on the Childers branch line, only 12 miles. There is a very excellent hotel of pretentious size, which is always well patronised during the summer season.

I have every reason to believe that there will soon be a considerable area of land placed under sisal hemp in the Isis district. There will always be a certain proportion of land dropping out of sugar cultivation owing to its requiring manure. Such lands will well repay the sisal hemp-grower, and many farmers expressed to me their intention of utilising it in this manner. The soil, climate, and rainfall are all that can be desired for the successful cultivation of the plant. Mr. T. H. Wells, of Farnbro', has just planted out an additional 10 acres on his property, and when the sugar season is over will plant out as much more. He has also given away a quantity of plants to his neighbours. Thus the industry may be said to have made a good start in the Isis.

SUGAR INDUSTRIES OF HAWAII AND TRINIDAD.

The *Sugar Planter* publishes an interview by a representative of a local paper with Mr. W. G. Kay, a sugar-planter of Trinidad, who was on a visit to Hawaii for the purpose of studying steam cultivation and methods of produc-

tion generally. Mr. Kay draws an interesting comparison between the two countries as sugar-producers.

Conditions are widely different in Trinidad and Hawaii. In Trinidad planters have to depend entirely upon the rainfall. The average production in Trinidad is 2 tons of sugar to the acre; in Hawaii it is double that amount. The total sugar output of Trinidad is 60,000 tons yearly. The cost of production is from 45 to 48 dollars per ton; in Hawaii it is from 40 to 45 dollars.

Mr. Kay was of opinion that Hawaiian planters go in for more intense cultivation; the labour-saving devices require a minimum of supervision. Triple crushing is the rule in Hawaii, while in Trinidad double rollers are used almost entirely.—*Agricultural News.*

SUGAR NOTES.

The Coming Crushing.

On this subject, the *Bundaberg Mail* is pleasant reading. Considering that in 1902 only 5,000 tons of sugar were made in the district, and only about 7,000 tons in 1903, the output which may reasonably be expected during the coming season will go to show the marvellous recuperative powers of the Queensland soil, and the excellent sugar-producing qualities of the varieties of cane now grown. More than these, it demonstrates the courage and persistence of the sugar-growers and their firm belief in the value and importance of an industry which furnishes 35 per cent. of the exported produce of the State. During the drought a visitor to the sugar districts might well have been pardoned had he predicted the utter downfall of the sugar industry. Yet, what do we see to-day? Let our readers judge from the prospects for the coming season, as set out by the *Bundaberg Mail*, and from the reports from the Isis, which go to show that there will be, in all, about 150,000 tons of cane crushed by the North Isis Central Mill (30,000), Colonial Sugar Refinery suppliers (80,000), Doolbi and Goodwood mills (each 10,000); and some 20,000 tons from Lynwood and Hapsburg will be crushed at Fairymead, Bundaberg.

Dr. Maxwell estimates the volume of sugar, the produce for 1904, will approximate 140,000 tons of a value of £1,505,000. The actual output may be less (the *Mackay Sugar Journal* putting it at 137,000 tons), but the greater probability is that it will be something more, even estimating the price of sugar at 10s. per ton less than during the two past years.

The *Mail* says:—

Although the magnificent promise that was before this district in the opening days of the year in connection with the cane crop is not destined to be realised, still, even with this fact admitted, there is much in the present appearance of the canefields surrounding us to justify the confident hope that a most satisfactory crushing will result. When an effort is made to analyse the situation in the face of well-authenticated figures the result is even more pleasing, for it reveals the fact that, with fair conditions continuing for another month or so, the sugar output for this year will certainly show less than a 25 per cent. shortage, even upon the record campaign of 1898. Anyone who has taken a drive through the sugar-growing areas surrounding Bundaberg during the past few weeks cannot have failed to be struck with the wonderful growth the crop has made since the early April rains; indeed, many of our oldest growers aver they have never before seen the cane crop make such marvellous headway in so short a space of time. Instances have come under our own notice where plant cane set last year, and intended to stand over till 1905, has made such excellent progress within the last two months that the owners have decided to harvest it in the approaching season. Of course the irrigated estates will all yield prolifically, especially Bingera, Fairymead, and Springhill; and while this is a source of great pleasure to all of us, the real cause for gratification comes from the fact that where the cane has not had the

advantage of irrigation—where, in fact, it appeared to be dying in March last—the yield will also be exceptionally good. A prime factor in bringing about this happy result is the fact that, although much human effort was wasted during the drought in vain attempts to win crops from the earth, the attendant failure was not wholly bad, for the reason that it afforded the soil opportunity to rest and recuperate, with the result that now, with the more kindly climatic conditions operating, the benefit of this rest is evidenced in the marvellous growth plant life of all kinds is making. Although we had a record crop in 1898, the yield of sugar being 38,000 tons for the Bundaberg and Gin Gin districts, the following year also brought the fine yield of 35,000 tons; still 1900 and 1901 saw the harvesting of half-crops only. For the next two years matters were infinitely worse, for in 1902 the output of sugar was but 5,000 tons, and for the following season but a couple of thousand tons better. Indeed, of the output for 1902 Bingera contributed about one-half of the total, thanks to the early installation of irrigation; and for last year the Fairymead and Bingera mills, operating on irrigated cane, were responsible for more than three-quarters of the aggregate. Hence one is justified in making the statement that for the past four years the cane land of this district has been recuperating, and the promise that existed in the young crop in January last gave ample evidence that a continuance of the weather conditions prevailing at that period would probably have resulted in the harvest of 1904 equalling, if it did not exceed, that of 1898. However, if we have been robbed of this experience we nevertheless have still left to us especially bright prospects, and, granted reasonably favourable conditions obtaining for another month or six weeks, it is safe to predict something better than a three-quarter crop for the district. Within the last week or two we have availed of the special opportunities that have been ours for obtaining an estimate of the probable output, and, after making due allowance for any inclination that may have existed in the minds of those appealed to for information to rose-tint the picture, we consider that, in estimating the coming season's sugar output at 28,000 tons, sound ground has been traversed by the highly competent judges responsible for such assessment. We understand that of a certainty no fewer than sixteen mills out of a total of some twenty in the district will crush this year, and the average run will be about four and a-half months; Fairymead enjoying the longest with a run of about six months. It is estimated that the Miara, Waterloo, Waterview, Springfield, Bonna, Sunnyside, Ashfield, and Oakwood mills will crush from 4,000 to 5,000 tons of cane each, or a total of 36,000 tons; Bingera and Fairymead will each deal with from 70,000 to 80,000 tons, or a total of 150,000 tons. Qunaba, Windermere, and Invicta will each crush from 20,000 to 22,000 tons, a total of 63,000 tons; Pemberton and Ashgrove, each 3,500 to 4,000 tons, a total of 15,000 tons; and the Gin Gin Central Mill, 20,000 tons—in addition to which there will be in the locality of Bellevue and Tegege another 7,000 tons, making an aggregate total of 284,000 tons of cane. Taking an average of 10 tons of cane to produce a ton of sugar, it will be seen that the estimated yield of 28,400 tons of sugar for the coming campaign is grounded upon excellent data. This is certainly a much more cheering outlook than as a community we permitted ourselves even to hope for three months ago; and, gratifying as the figures quoted are, it remains to be said that a mild open winter would substantially enhance the forecasted return. So far as bounty cane is concerned, it is calculated that the tonnage will reach about 40,000 tons, and should the work of harvesting be successfully accomplished it will mean that the bounty payments will total a sum of £9,000. All the mills fixed the opening of crushing operations for early dates in July. The Miara, a small mill with a good body of cane to handle, will probably be the first to set the ball rolling on or about the 1st of the month named. In the neighbouring district of the Isis a splendid season will also be experienced, the cane on all sides, but more especially in the northern end of the scrub, having made prodigious headway during the last couple of months. It is confidently anticipated that the aggregate quantity that will be available for the mills will reach about 150,000 tons,

which, on the customary estimate of 10 tons of cane to a ton of sugar, should give the splendid return in sugar for the district of about 15,000 tons. Although we are now in very late autumn weather, it must be admitted that almost ideal growing conditions continue; there is certainly a tinge of winter in the atmosphere in the evenings and early mornings, but under the benign influence of the midday heat the cane continues to thrive wonderfully. Even the late rains, which might reasonably have been expected to bring in their wake something approaching a cold snap, have been succeeded by most genial weather, hence the outlook grows daily more solidly encouraging.

IN THE COFFEE DISTRICTS OF BRAZIL.

COFFEE.—Mr. Thomas Thornton, of Messrs. Krishcke and Co., Santos, Dr. Raul de Rezende Carvalho, an esteemed Santos Commissario, and Mr. C. W. Walker, of Messrs. Arbuckle Bros., visited the interior in January-February of this year.

In *Planting Opinion* of 21st May, a detailed description is given of a number of coffee plantations visited by the above gentlemen, which we regret we are unable to publish owing to want of space. Some of these plantations, such as Sao Martinho, belonging to the Prado family, have 2,000,000 trees. In a big crop they picked 280,000 arrobas (7,000,000 lb.). This year, only between 70,000 and 80,000 arrobas are expected, which, for 2,000,000 trees, is a failure. The fruit has been continually falling off, which will account for the reduction. On another plantation there is an enormous extent of abandoned coffee. For two hours the train passed through coffee-trees transformed into dry sticks. Other plantations contain from 650,000 to 300,000 trees, and everywhere the tale is heard of bad, exhausted lands, poor financial resources, and abandonment of millions of trees.

Here is the general impression gathered from this visit:—

1st.—That we shall have a small crop next year. The flowering was enormous everywhere, but the trees are too weak to produce fruit. Also the flowering was followed by a prolonged Secca (drought), so that it could not take. There has been insufficient rainfall last year. The virgin forests have been cut down all over the interior, and it is greatly feared that this will produce permanent Seccas as in other countries which have been denuded of their forests.

2nd.—That an enormous number of trees have been abandoned. There are three reasons for this:—

(*a*) In the boom years coffee was planted in bad lands.

(*b*) Want of financial resources to treat properly such a large extension of coffee-planting.

(*c*) The great frost killed an enormous number of trees.

Mr. Thornton adds that he estimates that from 70,000,000 to 100,000,000 trees have been abandoned already, and many other Fazendas and portions of Fazendas will have to be abandoned in the next successive years.

Therefore he thinks that as the law for prohibition is rigorously enforced as regards planting, and as there is continual abandonment of coffee planted in poor land and old neglected trees, we are safe from big crops for eight to ten years.

Mr. Nauman's report, dated 3rd October, 1902, was a remarkable forecast of a state of things which now appears to be current.—Messrs. I. A. Rucker and Bencraft's *Trade Circular*.

FIBRE PLANTS IN MEXICO.

Very slowly Queenslanders are awakening to the fact that other countries are going ahead of us in most of the more valuable agricultural products. In cotton, fibres, fruit, timbers, and many other things we in Queensland are

either experimenting or peddling in quarter-acres, whilst other countries, with no better start, have already risen to be exporters. Take the item of sisal hemp alone. Queensland had a start in this matter of several years over Hawaii, yet to-day Hawaii is exporting sisal hemp, whilst here we are trying to discover whether ten years hence it may not become a pest like prickly-pear, utterly ignoring, or, rather, ignorant of, the fact that for twenty years or more the plant has been growing in a hundred localities in the country without anyone being aware of its presence or of its value. When the cotton boom began, the West Indians started at once to profit by it, and have had big prices for cotton, whilst Queensland is still doubting whether it will pay, and experiments are made with half a dozen seeds, usually planted at the wrong season. The few men who are really up to the business of cotton-growing, mainly in the Central districts, are trying hard to infuse a little energy into the growers of potatoes at 2s. per cwt., maize at 9d. per bushel, and such-like crops, but many seem rusted into the old groove. We do all we know by means of this *Journal* to show, and prove by incontestable figures, that there are crops which will return a good profit on the cost of production; but we are always met, except by the really intelligent farmers, with factious objections to any novelty. Now, see what Mexico is doing in the way of fibre production. Here is a consular report on Mexico for 1902:—

Another branch, which is also a very important one, and which, on account of the small amount of care required, is extending very rapidly, is the cultivation and exportation of fibres. Mexico is rich in plants, which would give very good and strong fibres, if they were only carefully attended to. At present the only fibres that are of any importance and receive any kind of care are henequen, ixtle, and the broom root. The first is extensively cultivated in the State of Yucatan, and the exports are made through the ports on that coast, principally, if not entirely, through the port of Progreso, whence it is carried by vessels belonging to a company formed for the special purpose of conveying it to New York, which acts as the principal distributing centre. Ixtle is grown in the more northerly States on the Gulf of Mexico, but especially so in the States of Vera Cruz and Tamaulipas, finding an easy outlet through the two principal ports of Mexico—namely, Vera Cruz and Tampico. Broom root is found in more or less quantities commonly throughout the Republic, but it is not cultivated.

The total exports of fibres of all kinds in the year 1902 amounted to 105,913 tons, of which 88,087 tons were henequen (sisal) (85,691 tons in the rough, and 2,395 tons in manufactured articles, principally hammocks and cordage), and the remainder consisted of 14,055 tons of ixtle (14,036 tons in the rough, and only 19 tons of manufactured articles, cordage, &c.), and 3,771 tons of broom root. The value of these exports, as given in the official returns, was £3,277,501, as compared with 103,518 tons of fibres, valued at £2,438,979 in the year 1901. The values of the different fibres exported during the year were £2,946,900 for henequen, as against £204,700 for ixtle and £125,900 for broom root. The price of henequen on 1st January, 1902, on the New York market, the principal consumer of this fibre, was 8¾c., gold (4⅜d.) per lb., equal to £40 6s. 8d. per ton, a price which was maintained without any marked change throughout the year. The broom root exported during the year was sent almost entirely to Belgium, while the ixtle found its way to the United States, the United Kingdom, and Germany.

COTTON-GROWING IN THE BRITISH EMPIRE.

By ALFRED EMMOTT, M.P.

(From a Paper read before the Society of Arts.)

The question of the growth of cotton in the British Empire has recently attracted the attention of all those who watch the development of our industries in general, and who recognise the importance of the cotton trade in particular.

The interest attracted by the subject is emphasised by these words in the gracious Speech from the Throne at the opening of this session:—

"The insufficiency of the supply of the raw material upon which the great cotton industry of this country depends has inspired me with deep concern. I trust that the efforts which are being made in various parts of my Empire to increase the area under cultivation may be attended with a large measure of success."

The obvious fact is, that the demand for the raw material of the cotton industry has, in recent years, exceeded the supply, and that this relative shortness of supply has helped speculators to enhance the price of cotton to figures which have seriously interfered, not only with the profits, but also with the amount of employment in the trade.

Last autumn, £2,000,000 was lost in wages in this country by cotton operatives alone, owing to short time and stoppages. At the present time the great majority of mills using American cotton are only working 40 hours a week instead of the normal $55\frac{1}{2}$ hours; mills which, were cotton cheap and abundant, would all be fully employed.

During the last few months cotton has varied from 7d. to 9d. per lb. in price, and it is nearly thirty years since such prices were known.

It will be of interest at this point to show the variations in the price of middling American cotton from 1870, in five-year periods:—

Average Price per lb. Middling American Cotton on the Liverpool Market for Quinquennial Periods.

	d.
1870-74 (five years) ...	9.21
1875-79 ,, ...	6.56
1880-84 ,, ...	6.35
1885-89 ,, ...	5.52
1890-94 ,, ...	4.66
1895-99 ,, ...	3.85
1900-03 (four years)...	5.47

It will be noted that the quinquennial average price fell regularly and persistently until the period 1895-99. The lowest year was 1898, when the average price was 3.31d. It rose to 3.56d. in 1899, and 5.47d. in 1900. Afterwards there was a fall, and the average price of each of the years 1901 and 1902 was about $4\frac{3}{4}$d. In 1903 it rose again to an average price of 6.03d., commencing the year at 4.68d., and ending it at 7.24d.; and in the first week of February, 1904, the culminating price of the great speculative movement was reached, when the price stood about 9d. Since then the price has been lower, but there have been wide fluctuations and much disorganisation in the industry.

There are two elements discernible in the increased prices of the last few years. The first may be called a legitimate rise of price due to an increased demand. The second is due to a singularly daring speculative movement on the part of a group of American speculators. It is quite impossible satisfactorily to separate the effect of these two causes.

The world's crop returns for the past twenty-five years, given in annual averages, is as follows:—

Annual Average of the World's Crop of Cotton, in Bales, in Quinquennial Periods.

	Bales.
1879-83 ...	8,680,000
1884-88 ...	9,600,900
1889-93 ...	11,540,000
1894-98 ...	13,360,000
1899-03 ...	15,680,000

These figures must be taken as approximations. I am not sure whether the cotton grown in China and Asiatic Russia is accurately accounted for in the earlier years. It must be remembered, too, that the bales vary in weight, both according to localities and even in the same locality. For instance, in 1879, the American crop was 5,074,000 bales of 434 lb. each, whilst in 1903 it was 10,758,000 bales of 495 lb. each. Egyptian bales contain about 700 lb. of cotton each, and the crop increased from 254,000 bales in 1879 to 825,000 bales in 1903. Bales of East Indian cotton weigh about 400 lb. each, and the crop increased from 1,543,000 bales in 1879 to over 3,000,000 in 1903, whilst the production of cotton in the rest of the world, composed of many different varieties, increased from 167,000 bales in 1879 to 1,500,000 in 1903. Mr. Hutton reduced the present crop of the world to bales of 500 lb. each, and gives the number as follows:—

United States	11,000,000
India	3,000,000
Egypt	1,000,000
Rest of the world	1,000,000

These figures are for an average crop, and are in substantial agreement with the other figures I have given. They show that the present annual production of cotton is about 8,000,000,000 lb. It is abundantly evident that the tendency towards an increased demand for cotton is still growing, and it is calculated that in five years' time 19,000,000 bales of cotton will be wanted, and in ten years 23,000,000 bales against a present production of only 16,000,000. The question of whence this increased supply of cotton is to come is of importance to the world at large; but it is of greater and more vital importance to Great Britain than to any other country. Our total production of cotton goods is estimated at £90,000,000 to £100,000,000. Of this amount some £72,000,000 worth is sent abroad, and constitutes the greatest manufactured export trade of any kind of any country in the world. It is obvious that, if this trade is to be curtailed by a short supply of cotton, the results to us will be very serious.

There is yet a further consideration in relation to

Our Vast Export Trade in Cotton

manufactures. A sudden rise in price hinders trade in every country, but its effect is much greater in countries in a lower state of civilisation. Much of our trade is done with Oriental or barbarous races, who do not take kindly to increased demands on their slender means, whilst the export of cotton manufactures to such races on the part of our competitors is comparatively small. It is of the utmost importance, therefore, on account of the magnitude of the trade itself, on account of its great usefulness in helping to pay some of our bills by roundabout methods, and on account of our great export to uncivilised or semi-civilised races, that we should strain every nerve to increase supplies of the raw material, and so keep its price at a reasonable figure.

The question now arises as to how this is to be done. So far as our troubles arise from unbridled speculation, the best remedy that can be applied is to smother the speculators in cotton. I have never seen any feasible plan for stopping speculation by legislation. Few speculators in raw material have died rich men, and paper bargains in cotton are as useful to the cotton-spinner as to the speculator. The remedy for the short supply of cotton is the same as that for the speculator. We want more cotton grown.

This brings us to the consideration of what are the prospects of larger supplies from existing cotton-fields; but, if I am not wearying you with figures, I want, first of all, to put before you some details of the growth and distribution of the American crop. You will remember that out of 16,000,000 bales America produces 11,000,000, or approximately 70 per cent. There has been

a great change in the distribution of this crop in recent years, as well as a great increase in the growth. The total distribution of the American crop for 1876-80 was 4,947,000 bales; for 1886-90, 6,878,000 bales; for 1896-1900, 9,664,000 bales; and for 1901-3, 10,762,000. The distribution was as follows:—

Distribution in Periods of Thousands of Bales.

	Great Britain.	European and other Ports.	U.S.A.	Total.
1876-80	2,151	1,245	1,551	4,947
1886-90	2,836	1,784	2,258	6,878
1896-1900	2,944	3,310	3,410	9,664
1901-03	2,978	3,600	4,184	10,762

The above table shows that England is using a much smaller portion of the American crop than was the case years ago.

The tendency on the part of the United Kingdom to use a small proportion of the American crop is due not only to the increase of spindles in the Southern States of America and on the Continent of Europe, as well as in Japan, Canada, and Mexico, but also to the fact that we now spin much finer yarns than we did some years ago, and use a good deal more Egyptian cotton. The American spindle spins about 90 lb. of cotton per annum, the spindle of the European continent 70 lb., and that of Great Britain 34 lb. Perhaps I may give at this point the number of spindles running in Great Britain, the Continent, United States of America, India, and other countries in 1895, 1899, and 1903:—

	1895.	1899.	1903.
Great Britain	45,400,000	45,500,000	48,000,000
Continent	28,200,000	32,500,000	34,000,000
U.S.A.	16,100,000	18,300,000	22,000,000
India	3,800,000	4,700,000	5,000,000
Others	...	...	3,000,000
Total	93,500,000	101,000,000	112,000,000

There are three observations to be made on this table. First, the spindles of "other" countries were not all started between 1899 and 1903, but I have not accurate details of the earlier period. In the second place, the growth of spindles in India has been materially checked during recent years; and in the third place the growth of spindles in Great Britain has shown a greater increase in the last period than those on the Continent. It should be added that the increase in the United States of America is mostly in the Southern mills.

The danger of our dependence on American sources of supply is twofold. In the first place, if the increase in the Southern mills is to continue—a point which is somewhat in doubt, and about which I cannot speak with certainty—the demand for the market of the United Kingdom must become a more and more negligible factor. In the second place, unless the supply of American cotton is greatly augmented, we shall continue to be more or less in the hands of speculators.

I come now to the possibility of

Increased Supply from Existing Sources.

In reference to the United States of America, I am quite unable to forecast what may be done in the future, either in the direction of the increase of the total production, or of the proportion of that production which will be available for our use. There are two considerations to be borne in mind as regards the increase of production—firstly, whether the acreage of the crops is likely to be greatly augmented; and, secondly, whether the growth per acre will show

any material change. My opinion on the question of acreage must be taken for what it is worth, for reports are very contradictory. Judging by the past, I am inclined to believe that the acreage will be increased.

It is unnecessary to allude at length to the question of the yield per acre. There is a general impression that the yield in America is decreasing, but, having looked somewhat closely at the figures, I cannot, at present, find any justification for it.

Our next chief source of supply is

EGYPT.

This cotton is longer, finer, and more silky than the American variety; it is more suitable for our finer manufactures, and lends itself to the newly discovered mercerising process which makes it look almost like silk. We are the largest consumers of Egyptian cotton, and obtain one-sixth of our total supply from that country. The Assouan Dam will, no doubt, do something to increase the acreage under cotton. I understand, however, that Lord Cromer estimates that it will only increase the total cultivable area by 15 per cent., half of which is suitable for growing cotton. It will be seen, therefore, that no great addition can be made to the amount of cotton grown in Egypt.

We obtain a certain amount of cotton from Brazil and Peru. The quality is somewhat harsh, and, although for many purposes these varieties can be used instead of American, our consumption of them has very materially decreased since 1870. There has also been a great decrease in the amount of East Indian cotton we consume. The length of the staple is very short, and it is quite unsuitable to the manufacture of any of our finer goods. I shall deal with the possibility of further supplies from India when I reach the question of the work of the British Cotton-growing Association.

This list exhausts our principal sources of supply, but we get small quantities of cotton from Chili, Venezuela, Columbia, the British West India Islands, and British Guiana, European and Asiatic Turkey, and a ton or two even from Australia and New Zealand. From none of these countries, however, has the supply of cotton suitable for our purposes been increasing of late years. I come now to the efforts that are being made to extricate the cotton trade from the dilemma in which it finds itself placed. This is not a small problem—it is a large one.

There are, at present, probably 45,000,000 to 50,000,000 acres growing cotton, or, say, 75,000 square miles, or nearly two-thirds of the area of the United Kingdom. In ten years' time we want to have a further area, half as large again, planted with cotton. Let me put it in another way. Take a length of railway, about 30 miles. To keep one good modern mill running on ordinary medium counts would require a plantation extending for half a mile on each side of the line for the whole of that distance. In addition to the present area, the world will want at least another thousand such plantations within the next ten years. The value of the cotton produced on this extra acreage, at an average of 5d. per lb., would be £70,000,000, or, at present prices, over £100,000,000. What a stimulus to the trade of the Empire if we can grow even half of it in our own possessions!

We have in the British Empire almost endless territory suitable for the growth of cotton. It would be a clear Imperial gain that we should grow it there, for, whilst the extra cotton would supply our mills and discourage speculators, the people who grow it would become excellent customers for our manufactures.

The British Cotton-growing Association has been formed to try to achieve this desirable end. Its inception was due to the Oldham Chamber of Commerce and to Sir Alfred Jones. At the annual dinner of the Chamber, in January, 1901, a discussion took place on the important question of increasing the world's supply of cotton. Subsequently a committee was appointed to make inquiries, other Lancashire chambers of commerce were approached, and a

meeting was held on 18th February, 1902, at the Manchester Chamber of Commerce, of those interested in the question. Sir Alfred Jones had meanwhile been dealing with the question with his usual energy. In May, 1901, he sent out 10 tons of seed to our West African colonies; he impressed on the Governors of those colonies the importance of increasing the growth of cotton there, and, with a generosity no less real because it may eventually prove to have been far-sighted, he offered special facilities for the shipping of the first thousand bales of cotton that may be sent to this country.

On 12th June the association was publicly inaugurated, and it was decided to raise a guarantee fund of £50,000 for the purpose of making the necessary preliminary inquiries, and of undertaking experiments, and providing machinery wherever it seemed advisable. Instead, however, of a guarantee fund of £50,000, it is now intended to raise half a million; instead of isolated experiments, expert advice, and presents of solitary gins, one or two considerable plantations and large advance to cultivators are under consideration. Great encouragement has been received from Government officials of all kinds. The drawbacks have been—firstly, the lack of response on the part of the bulk of the cotton trade, but I hope this will now be altered; and, secondly, the fact that the association has been so overwhelmed with correspondence and appeals from all tropical and subtropical parts of the Empire that it has been difficult to concentrate its attention or even decide wisely on what seems best worth doing. I will now take the different parts of the Empire in which cotton can be grown, and state very briefly what has been done, and what it is hoped to do.

Cotton in India.

India was the original home of the cotton trade. Even the word "calico" comes from India, and the finest muslins have been made there from time immemorial. So far, little has been done by the British Cotton-growing Association for India beyond holding many interviews with officials and conducting a large correspondence. The Indian sub-committee of the association believes that much may be done there. On 27th February, Mr. Brodrick, the Secretary of State, kindly granted an interview to a deputation. He made the interesting suggestion that the British Cotton-growing Association should start a plantation in Burma and try to produce a better quality of cotton there. Several earnest attempts have been made in the past in this direction in other parts of India.

All the various kinds of cotton grown in India at present are, however, too short for general use here. In the old days we used them largely for coarse counts and coarse cloths, which were sent to the East; but India can now make these more cheaply for herself.

Three things stand in the way of any great growth of cotton in India suitable for our purposes. The first is that exotic seed has never yet been successfully cultivated there for any long period. It seems as if, in regard to cotton, the soil forces the product of the seed into some primeval type of its own choosing rather than gives it fair play to reproduce its own prototype. The two other difficulties are removable. One is that sufficient care is not exercised in the selection of seed, and this is vital for growing good cotton. The other is the primitive methods of cultivation used by the Indian ryot. How long it will take to remove them, I leave to those who know India better than I do to judge.

The West Indies.

From 1786 to 1790 we received from the British West Indies, British Guiana, and British Honduras 45,000 bales a year out of a total consumption of 63,000 bales; whereas of late years we have not imported more than 1,000 bales of the same size. In these islands can be grown the very finest kind of cotton which is used, commonly known as the Sea Island variety. I am glad to say the movement for an increased growth of cotton has been taken up with great enthusiasm, many thousand acres are planted, and next year the acreage will

be still greater. Sir D. Morris, the Imperial Director of Agriculture, is taking the deepest interest in the question, as is also Sir Gerald Strickland, the Governor of the Leeward Islands. The impoverished condition of landowners has made many of them unable to undertake the growing of cotton without financial assistance, but by the aid of the Colonial Office it has been arranged that grants shall be made to respectable planters, under the joint guarantee of the local authorities and the British Cotton-growing Association.

Correspondence is being carried on with Australasia, Ceylon, Burma, Borneo, and Fiji, and some experiments are being made in Ceylon (and Queensland—Ed. *Q.A.J.*). In reference to Australia, where there are great areas of land suitable for growing cotton, the difficulty lies in the great cost of the production of cotton by means of white labour.

Cotton in Africa.

I have already dealt with Egypt, but have not mentioned the Egyptian Soudan, the ownership of which we share with Egypt. Dr. Hagberg Wright wrote to the *Times* on 5th January, enclosing a letter from a friend of his, in which this extract occurs:—

"The inverted alluvial delta of the Egyptian Soudan, which is situated between the White and the Blue Niles, is even more favourable to the growth of cotton than the lower parts of the Nile Valley, and affords ten times the area for the plantation of cotton of that available in Egypt proper."

It seems quite certain that, when the Suakim-Berber Railway is open, cotton can be grown and sent to Europe at very reasonable rates. The association has constantly pressed upon Lord Cromer, through the Government, the necessity for building this railway with as little delay as possible, and he has promised that this shall be done. The principal difficulty one foresees is the question of labour; but, in these days of wholesale immigration from other countries, is it too much to hope that it may be possible to attract some of our Indian fellow-subjects to settle there?

A new field of cotton has also been opened in the neighbourhood of Tokar, on the Red Sea. From 20,000 to 30,000 acres are already under cultivation, and it is said that this area will be greatly increased in the future. It is also stated that, if the Khor Baraka were dammed, some 2,000,000 acres of land would be cultivable between Tokar and Kassala. On the whole, the Egyptian Soudan is one of the most hopeful fields for the growth of cotton for the United Kingdom, because it is capable of producing, apparently at reasonable rates, cotton which is long in staple and fine and silky in quality.

Going further south in Africa, we come to Uganda and British East Africa. The Foreign Office has sent an expert there, and Sir Charles Eliot reports that there is plenty of good cotton land and a supply of cheap labour. It has also been shown that cotton can be grown there from Egyptian seed quite as good as that grown in Egypt proper, but the cost of growing on a commercial scale has not yet been proved.

Again, going south, British Central Africa is the next available field. Here there is a wild cotton plant (*Gossypium anomalum*) and also a plant introduced by the Arabs *(Gossypium herbaceum)*, which has been cultivated intermittently for centuries, but the best cotton in this district is grown from recently imported Egyptian seed. It is nearly fifty years since Livingstone was despatched to the Zambesi and Lake Nyassa, to open up the country to cotton-growing, for a cotton famine was threatened in the fifties, and, as the world knows, actually took place in the sixties. The chief obstacles to Livingstone's schemes lay in transport difficulties. During only six weeks in the year is the Zambesi-Shire navigable to the verge of the Shire Highlands. The railway which is being built from a point on the navigable Shire through British Central Africa to Lake Nyassa is meant to meet the difficulty.

The present situation is this: Cotton is being grown successfully, and can now be put on the Liverpool market at 4½d. to 5d. per lb. On the table are samples of two kinds of cotton grown from Egyptian seed, which have been

sold recently in Liverpool at $7\frac{5}{8}$d. and $8\frac{1}{2}$d. per lb. respectively. These samples were sent to the Society of Arts by the African Lakes Corporation, Limited, who imported the cotton. Labour, however, is not too plentiful, and that "Imperial" policy which is depriving this district of its labour, in order to work a few more stamps in South African gold mines, is going to make it less plentiful than ever. This policy seems likely to delay even the completion of the railway, which is a necessity of the first importance. When the railway is built, there is an enormous territory waiting for development. Even under present circumstances some advances have been made to cultivators, and, if sufficient funds are forthcoming, it is in contemplation to advance £100,000 or £150,000, in order that 100,000 acres may be put under cultivation.

It is important to remember that men like Sir Harry Johnston, who knows this district well, and who recently sent a letter to the *Times*, from which I have largely borrowed, are the most keen and enthusiastic about cotton-growing in this territory.

The only other British possession on this side of Africa which I need name is Rhodesia, in which experiments are being made by the British South Africa Company, with considerable hope of success.

Turning now from East to West, it is unnecessary that I should tell you cotton can be grown in Gambia, Sierra Leone, Lagos, Southern and Northern Nigeria, as well as in the French and German possessions in that region, in the Cameroons and Congo region. The only question is the extent to which it can be grown, and the price at which it can be put upon the English market.

In Gambia an experimental farm is being started, but it is not an easy matter to induce the natives to take up anything new. Some very fair samples of cotton have been grown. Gambia possesses an excellent waterway, and it is important for this colony to cease to be so dependent as it is on ground nuts.

There is a larger field in Sierra Leone. Experiments have been made with American seed, but the result is still doubtful. The best cotton sent home so far has been a native variety. The British Cotton-growing Association has been fortunate in securing the services of Mr. Shelby Neely, an able young American from the Mississippi Valley; three expert black farmers have also been sent out, and every effort is being made to ensure progress.

We now come to the Gold Coast Colony. In part of the colony, labour is so fully employed in gold-mining that the supply is short and the cost is high.

Passing by Togoland, where the Germans, with their usual scientific thoroughness, are trying to establish cotton cultivation, and the French colony of Dahomey, we arrive at Lagos, a most hopeful field. Here is a large and intelligent population, already interested in agriculture and acquainted with cotton cultivation, if only by primitive methods; there are large tracts of undulating land in the Hinterland; there is a railway slowly, if most expensively, wending its way into the interior; there is a Governor (Sir William MacGregor) who takes a great interest in the question, and there are experts who are very sanguine about the future.

Unfortunately, a good deal of ill-feeling has been caused by the revival of the old custom of levying octroi dues in Abeokuta and Ibadan. I state this as a fact; but express no opinion on the merits of the case. Much of the seed recently sent out was not sown, and progress has not been so quick as was hoped. There was also a deficient rainfall in 1903. The needs of the future are the extension of the railway beyond Ibadan towards Ilorin, and, if the colony cannot afford to carry out this work, it is distinctly a case where Imperial assistance, either by funds or guarantee, should be given.

Cotton has been grown here for export in the past, but, owing to the fall in the price of American cotton, the trade ceased to be profitable. Mr. Hoffman, one of the experts to whom I have alluded, reports most favourably of the care given to the cultivation of the plant in the Ekiti country in Yorubaland, but he

insists on the want of means of transport in the interior, and on the consideration that the price paid to the native for cotton must not fluctuate, "as the people are not in a condition to meet such changes."

Adjacent to Lagos is Southern Nigeria. An expert, Mr. Prince, was sent out there, and he cleared and cultivated a plantation of 50 acres close to Onitsha, on the Niger River. A large sample of this cotton has been sent home, and is said to be exactly what is wanted in Lancashire. It is in contemplation to make a large plantation on the Soho Plains, in Southern Nigeria. The Government has offered to defray the cost of making a scientific analysis of the soil, and has also placed at the disposal of the British Cotton-growing Association the services of Mr. Hitchens, who has had a large experience of the agricultural possibilities of the colony.

I may perhaps explain at this point that it is not the intention of the association to develop cotton-growing by a system of large plantations. It is obvious that it is impossible to supply the huge quantities of cotton that are required by any such method. As soon as slavery was abolished in the United States, cotton ceased to be grown in large plantations even there; and in Africa a system of native farmers on small plots is desirable, if such a system is feasible. This suggested large plantation in Southern Nigeria must be regarded rather as an object-lesson and a technical school than the beginning of an attempt to supply by this method the deficiency from which we suffer.

NORTHERN NIGERIA.

I now come to the last, but by no means the least, of the British possessions in which there is great expectation of an increased yield of cotton. I allude to Northern Nigeria, of which Lady Lugard has given us such a graphic account. It is not too much to say that our greatest asset there is the Governor, Sir Frederick Lugard, who has shown such a splendid combination of energy and pluck, of patience and endurance, of firmness and fairmindedness in that country—qualities which have quickly achieved a remarkable success.

Northern Nigeria has a territory of 320,000 square miles, and a population of perhaps 10,000,000. That population is much less than it was, and much less than the country will support, and is composed principally of Haussas, the most intelligent and among the most civilised of the inhabitants of West Africa. By nature peaceful and industrious, by inclination keen and business-like, it is impossible to over-estimate the commercial possibilities of this interesting race. As regards cotton, it is indigenous in the country, and has been cultivated and manufactured there for a thousand years or more. It is a long way, however, from any part of Northern Nigeria to the coast, and the first imperative necessity is the building of a railway into the interior and the making of roads. A light railway can be built from a suitable place on the Niger to Kano for from £500,000 to £1,000,000, and, seeing that the British taxpayer is already paying a subvention of £400,000 per annum, it is surely worth while to advance a little more to develop the country, and it will, probably, quickly pay for itself. If no railway is built, it is impossible to carry cotton down to the Niger at a rate which would leave any reward to the cultivator at all, and it will be useless to expect any large increase of trade with the interior. If a broad-gauge railway is attempted, it will take many years to build and cost millions of money. A light railway can be quickly constructed, and would soon test, in a practical way, the commercial possibilities of the country.

I may now sum up the general considerations which arise from the work already done by the British Cotton-growing Association. In the first place, it is proved that there is a vast territory in many different portions of our possessions where cotton can be successfully grown. Secondly, whilst it is too soon to be certain in which of these possessions suitable cotton can be grown at a price to compete with the American and Egyptian supplies on which we now depend, there is every reason to suppose that when the Suakim-Berber and the Shire-Nyassa railways are completed, cotton can be grown cheaply enough in the Soudan and British Central Africa to make it a commercial success, and there

are strong hopes that this may be done in other parts of the Empire. Thirdly, the chief difficulties in the way are

LABOUR, TRANSPORT, AND FLUCTUATIONS OF PRICE.

As to labour, it is a very doubtful policy to draft native labour from British Central Africa (where 12,000 acres are said to be already under cotton, and where labour is always short in the wet season) to the mines of South Africa. But there, as elsewhere, labour difficulties can only be met by patience and by just and reasonable treatment of all who can be induced to work. As to transport, our Governments must be more ready than they have been in the past to make railways and roads where necessary. As to fluctuations of price, the British Cotton-growing Association must minimise the effect to the native as much as possible. Fourthly, it is obvious that the increased growth of cotton in Africa will be best achieved in the long run, not by native labour in large plantations, but by native farmers. No system of large plantations can possibly meet the case nearly so well as a system of small farms cultivated by native owners. The problem is vast, and, if the native can be induced to undertake cotton culture on his own account, his interest will be stimulated much more than it can be by an offer of wages. I am aware this is a disputable point, and I ought not to treat it dogmatically. Africa is large, and one type of native varies from another much more than one European from another. Fortunately, the native African is for the most part a born trader, and, in many cases, willing to work if he is sure of a satisfactory market for his produce.

In spite, therefore, of the partial failures of the past, the new movement may be said to have every reasonable prospect of success. The most hopeful fields of the future are now possessions or protectorates of the Empire, which could not have been exploited before because of lack of transport facilities. We have got beyond the old ideas of *laissez-faire* run mad, which argued that it was never the business of a Government to make a railway which private individuals would not undertake. All this is to the good, and a sound combination of private enterprise and Government assistance should carry us far on the road to achieve the ends we have in view.

That there are great difficulties to surmount, no one will deny; that progress may be slower than some ardent souls desire is probable; but we must never forget the urgency of our needs, and we must not lose sight of the consideration that the Soudan and British Central Africa and Nigeria have each sufficient territory to grow, and a soil and climate suitable for growing, millions of bales of cotton every year.—*Tropical Agriculturist*, Ceylon.

THE COTTON SITUATION OF THE SOUTH.

DR. NORMAN ROBINSON.

The textile industries of the world are to-day facing most serious, not to say alarming, conditions. There is no known substitute for cotton, and cotton has taken a back seat—so far back, indeed, that it takes a very liberal expenditure of cash to get within reaching distance of it.

Now all this, while hard on the consumers, manufacturers, workmen, and all in any way concerned in textile industries, is not without its hopeful side. Somebody is going to make a "mint of money" in cotton during the coming year. The brokers and middlemen, of course, whether cotton is up or down, they always scramble to the the top. But with wise management the planters should this year have their "innings" also.

The natural stimulus, which the high prices of this staple will give to cotton production during the coming year, is already in evidence. A good many new men are talking seriously of undertaking the growth of this staple. Planters, generally, are planning for an increased acreage. Fertiliser factories in the

south report that business was never so brisk, and in a hundred ways the indications come to us that a larger crop than was ever before planted will be tried this coming year.

Now what is to be the outcome of it all? This is a very large question, and one much more easily asked than answered. Will a crop of 12,000,000 bales, should it be grown, again cut the price of cotton in two, as it did in the record year of 1898, or will the world be so hungry for the fleecy necessity that it will quietly absorb even this amount at something near the present prices.

As prophecy is a lost art, the writer will venture upon no prediction. Still there are some well-known facts which it may not be amiss to recall. As has been said, there is no substitute for cotton, and there is no substitute for the southern States in the production of cotton. Africa might do it, if it were not for the Africans, and that settles the matter. The monopoly of cotton production for many years is here and will remain in the south.

Then, too, there is the "weather," and the insects with an almost infinite power of reproduction and harm-doing, with bacteria and fungoid diseases as close rivals in the work of destruction. All these and other malign agencies may be safely counted on to greatly diminish what might otherwise prove to be an unmanageable amount of over-production.

Besides, the world and its commerce are by no means stationary. What the cotton-mills would consume and pay for five years ago is by no means the measure of the demand for the coming year. New mills, new industries, new markets are springing up all over the broad earth, and there is simply but one source from which the bulk of the cotton supply must come.

Now, under these conditions, what is the wisest method for the planter to pursue? Simply to plant a larger acreage and go on in the same old rut—of scanty fertilisation and meagre production? That this will be the plan generally pursued, experience abundantly demonstrates. The writer is thoroughly convinced that there is "a more excellent way"—one involving much less risk of loss in the event of unexpected low prices, and much greater profits in case present prices are even approximately maintained.

For a good many years the writer has been fairly familiar with the general plan of fertilisation and the character and amount of fertilisers used through the so-called "cotton belt" of the southern States. He has repeatedly preached a gospel of much more liberal soil treatment, but he has reason to suspect that his converts (possibly from some fault of the preacher) have been by no means so numerous as the importance of the subject would seem to warrant. Some facts have recently come in his way which, if possible, give emphasis to his long-time convictions, and which makes it even more incumbent upon him to "cry aloud and spare not!"

A few days since, as I visited one of the branch houses of one of the largest fertiliser manufacturers in the south, the manager pointed out to me a big pile of what may be termed the staple fertiliser of a large section of the cotton belt. "There," he said, "are 1,300 tons of our '8-2-2' mixture, which I have just made up for our cotton-growers as a starter. It won't last long, but it will give us something to go on." "But don't you sell anything but this low-grade goods?" "Oh, yes; we make up all sorts of formulas, but 8-2-2 is the standby."

Well, now, in plain English, what is this 8-2-2 mixture? Simply this: It briefly described a fertiliser guaranteeing 8 per cent. of phosphoric acid, 2 per cent. of potash, and 2 per cent. of ammonia. It is manufactured from superphosphate, kainit, and the cheapest obtainable ammoniates. "And how much of this low-grade fertiliser do your customers use per acre?" "Oh, two or three hundred pounds," said he. "And do you recommend it?" said I. "Not at all," said he. "The cotton-growers seem to buy it partly from habit, but mostly because it is cheap, I suppose."

There is the whole business of poor and unprofitable cotton-growing in a nutshell. It perfectly explains the thousands and thousands of knee-high 150 lb. to the acre lint cotton-fields that one sees in the autumn as he rides

over the railroads of Alabama, Georgia, and the Carolinas. Think of it! Only 4 to 6 lb. of potash and the same supply of ammonia per acre! It is like putting a pig in a pen and giving him a whole ear of corn, and saying, "There, piggy, are your summer rations; get fat on that!" The pig would probably decline to starve to death, and root out of his pen, and trust to his nose for a living. The poor cotton stalk has to "root, hog, or die" where it stands, and planters and plant grow poor together.

The day is coming when a more intelligent and far more profitable system of agriculture will obtain in the south. Men will not strive to spread out, but to concentrate—not to see how far a little low-grade fertiliser can be made to go, but to find how large an amount of high grade can be profitably used. Any planter who has any land that is fit to cultivate in cotton at all ought to be ashamed to confess that he grows only 150 lb. of lint cotton to the acre. There are very few plantations that, by a proper system of fertilisation and culture, cannot be made to yield four or five times as much as is now grown. Even where by constant cropping the fertility of the soil has been exhausted, it is generally possible to restore it to its primitive fertility by a judicious system of crop rotation and fertilising. Often the difficulty comes from the fact that the supply of humus and, of course, of nitrogen is exhausted. Cow peas, manured with at least 75 lb. of high-grade potash and 300 lb. of superphosphate per acre, and either pastured off or ploughed in, will furnish both the humus and the nitrogen, and will start the land well on its course toward a return to its primitive fertility. This may be followed with a crop of corn, well fertilised with stable manure and an additional supply of half as much potash and phosphoric acid as was given to the cow peas the previous year. Then the cotton will profitably come in; and at least 300 lb. to the acre of a fertiliser containing, say, at least 8 per cent. of available phosphoric acid, 4 per cent. of potash, and 3 per cent. of nitrogen should be applied; and with a fair season, and no insect or other enemies to interfere, a bale of cotton to each acre may safely be expected.

Now this prescription is a general one, and will by no means fit every case. Only the man who is tired of the old rut will be likely to try it, and the wise course in many cases will be to make the experiment in a small way at first. —*Florida Agriculturist.*

COTTON NOTES.

Whilst we always advise cotton-growers not to be too sanguine in respect to yield of cotton per acre, but to be satisfied to consider 1,000 lb. of seed cotton a fair average crop, yet it need not be matter for surprise to find the yield in some cases, under favourable conditions of soil, weather, seed, cultivation, &c., amounting to nearly double that quantity. For instance, we find the following notes on cotton experiments at Nevis, West Indies, given in the *Barbados Agricultural News:*—

The Hon. C. Arthur Shand has forwarded the following notes on the experiments in cotton-growing at the Experimental Station at Nevis during 1903-4:—

The experiments were particularly designed to test the best distance for planting cotton. For this purpose four plots (A, B, C, D) were planted in cotton at varying distances. The following table gives particulars for each plot:—

Plot.	Area in Sq. Feet.	Distance between Plants.	Yield in Lb. of Seed Cotton.
A	708¾	3 x 3	36¾
B	708¾	2½ x 3	24¼
C	708¾	2 x 3	26¾
D	708¾	1½ x 3	41¾

It will be observed that the best results were obtained from plots A and D, especially the latter. The land was treated in the same manner for each plot, and no manure of any kind was applied. The total yield from the four plots (about $\frac{1}{15}$-acre) was 129 lb. of seed cotton, or at the rate of about 1,900 lb. per acre.

Owing to frequent applications of Paris green, no damage whatever was done by the cotton worm.

A planter writes to the above journal:—I am of opinion that land for Sea Island cotton should be regularly cultivated and manured as for canes. Under such treatment the yield of seed cotton has averaged 1,000 lb. per acre. This gives me a return equal to that from canes, but in eight months instead of sixteen months.

The planter continues:—I have had two places under my charge where these results have been attained, and I propose to take up cotton-growing on a still larger scale this year. There can be no doubt that Sea Island cotton is the best to grow—that is, provided it is well looked after and the cotton worm is kept in check.

The Secretary of the British Cotton-growing Association writes to the Imperial Commissioner of Agriculture, under date 11th April, 1904:—You will be glad to hear that the cotton coming forward is fetching good prices, especially that from Barbados. For some reason or other the cotton from Anguilla, St. Kitt's, and some other small islands, is not quite up to the mark.

SHIPMENTS OF COTTON FROM BARBADOS.

The prices given below as being actually obtained for cotton in the English market should prove an incentive to farmers in Queensland to plant considerable areas of cotton next month. The very best American seed has been ordered by the Department of Agriculture to arrive in time for September planting, and we would advise intending planters to lose no time in making application for it, as only 3 tons will be available:—

A return, with valuation of 82 bales of cotton shipped from Barbados on 2nd February and 12th March last, was received by last mail from the British Cotton-growing Association.

There were 69 bales of Sea Island cotton and 13 bales of Egyptian cotton. The average price quoted for the Sea Island cotton was just under 15d. (30c.) per lb. The highest was 16½d. (33c.) per lb.; the lowest, 13d. (26c.) per lb.

The highest figures, 16d. to 16½d. per lb., were quoted for a Sea Island cotton described as "clean, bright, well prepared, with fine, long staple."

The lowest price was for Sea Island cotton described as "staple short, coarse, and irregular."

For Egyptian cotton the highest value quoted was 8¾d. (17½c.) per lb., described as fairly clean, staple irregular, but fairly strong." The average for Egyptian cotton was a little over 8d. (16c.) per lb.

Later advices to hand state that of 51 bales of Barbados cotton recently shipped to Manchester the prices were as follows:—Forty bales of Sea Island cotton sold for 15d. to 16d. per lb.; 11 bales of Egyptian cotton sold for 8d. to 10d. per lb.

COTTON IN JAMAICA.

In the *Bulletin of the Department of Agriculture* of Jamaica, one correspondent writes:—

Cotton seems to grow like a weed, and gives a larger return than generally stated. One acre, planted end September, 1903; supplied twice, 80 per cent. grew; cost to end March, £5 6s. for everything; 1,200 lb. seed cotton picked, picking still going on, with probable return of as much more. Bushes in full blossom again. Egyptian variety. Planted near sea, distant about 25 chains, and 100 feet elevation; in exposed situation, and bushes much blown about by the frequent high winds and "northers."

Mr. J. D. Ormsby, Lime Hall, writes:—

I think I can afford some information, *in re* cotton-planting, which may be of service to intending growers. I was very unfortunate with the Egyptian seed you sent me some time ago, not more than 1 per cent. germinated, and on searching the holes in which I had planted them I found only the husks; insects had eaten all the kernels. Insects are the pests of my life—my place abounds in them. I have to soak all my seeds in a solution of Jeyes' fluid before I plant them, so I thought I would try that with the cotton too. I began planting them on Monday, 4th instant, and continued until Friday, 8th. On Sunday eve I put 2 lb. of the cotton seed in 2 quarts of the solution—$\frac{1}{4}$ pint of Jeyes' to 4 gallons of water—and on Monday I began to plant. On Friday, 8th, those planted on 4th had germinated, and to-day they are about $1\frac{1}{2}$ inches high, with four open leaves, and I do not think I shall lose 5 per cent. of the seeds. I planted two seeds in each hole, and in almost every case two plants are up. I planted over 2 acres with the seed you sent me, 2 feet 6 inches to 3 feet apart. I am sorry now that I did not plant only one seed in each hole. I had recently dug 140 chains of trenches, 18 inches by 18 inches, and the loose earth was at the side of the trenches clay land. I planted on all those ridges, and $\frac{1}{4}$-acre of same clay land thoroughly forked, $\frac{1}{2}$-acre of gravelly land. I planted on hills dug like sweet potato hills, 2 feet 6 inches apart, and the balance I planted in dry land. I had three lifts of the fork in each hole, each lift raising the earth and loosening it, giving a diameter of about 18 inches loose earth, and two seeds planted in the centre of each. I covered all seeds about an inch. Later on I will let you have results. The seeds planted on Friday have germinated. Seeds should be soaked not less than 12 hours.

Syrian Cotton-growers in Jamaica.

At a meeting of the Board of Agriculture, the secretary read a minute from Mr. Fursdon, reporting that he had entered into arrangements with some Syrians, one of whom had long experience in all the branches of cotton cultivation in Egypt, whereby they could grow cotton as an experiment on 40 to 50 acres of land in front of his house at Two-mile Wood, Hartlands, on very reasonable terms, and he had given him an option to purchase a block of 480 acres of land within the next twelve months.

The board expressed satisfaction that these Syrians had been so encouraged, and agreed that everything should be done with a view to facilitate the experiment.

The secretary submitted applications for the use of the steam gin at Spanish Town, from the Hon. T. H. Sharp, A. J. Webb, H. T. Ronaldson, and Mr. Fursdon, on behalf of the Syrians.

Disinfecting Cotton Seed.

As there is always danger of introducing insect or fungoid pests with seeds from foreign countries, disinfection of such seeds should always be carried out. Mr. Ormsby, in his letter printed above, appears to have been most successful with his plants when he disinfected the seed. In the experiments given below, which we take from the *Agricultural News*, Barbados, a 1 : 750 solution of corrosive sublimate appears to have given the best results.

In a recent issue of the *Agricultural News* (Vol. III., p. 117), an account was given of some experiments carried on in the Mycological Laboratory of the Imperial Department of Agriculture, to test the effect on the germination of cotton seeds of steeping them in solutions of corrosive sublimate. In this series of experiments the seeds were planted immediately after being taken from the solutions.

It was then mentioned that a second series of experiments had been started. This was a duplicate of the first series, but, in addition, the effect of a 1 : 100 solution was tested. The results were as follows:—

Strength of Corrosive Sublimate Solution.	Percentage of Seeds Germinated.
Water	76
1 : 1,000	74
1 : 750	83
1 : 500	78
1 : 250	81
1 : 100	43

The 1 per cent. solution thus had a marked effect in reducing the percentage of seeds germinated.

A third series was started to test the effect of steeping the seeds, drying them, and then planting at different intervals. The seeds were all soaked in a 1 : 500 solution of corrosive sublimate, for one hour, on 23rd March. The results were:—

A. Seed planted immediately,
percentage of seeds germinated ... ... = 73
B. Seed dried, planted 6th April (after 14 days),
percentage of seeds germinated ... ... = 65
C. Seed dried, planted 13th April (after 21 days),
percentage of seeds germinated ... ... = 74
D. Seed dried, planted 20th April (after 28 days),
percentage of seeds germinated ... ... = 72

COTTON GIN FOR STANWELL.

A movement has been set on foot, and is, we learn, progressing satisfactorily, to purchase a cotton gin for the Stanwell district. We understand that a Melbourne firm is also in the field with the intention of erecting up-to-date cotton ginneries in two if not more portions of the State. The wants of the Central districts will be first inquired into. The promoters' intention, as far as we can learn, is to offer the farmers a fixed price per lb. for their cotton in the seed, the price to be increased if the cotton values in England are raised; but not to be decreased in case of a fall in price. This engagement would be for three years, the farmers entering into an agreement to either sell all their cotton to the ginnery or to have it ginned, if they prefer it, on reasonable terms. It is possible that, in addition to the cotton-ginning business, an oil mill will be erected for utilising the seed, and machinery will be added in due time for the cleaning of sisal hemp. To enable the gins to run for three months continuously, the produce of 500 acres at 1,000 lb. of seed cotton per acre would be required. At, say, £6 5s. per acre, this would distribute over £3,000 in the district in which the factory is situated for cotton alone; the by-products, such as oil, oil cake, &c., would provide a considerable amount of work as well. We trust that in good time we shall have cotton ginneries dotted all over the country from Cape Byron to Cooktown, and along our Western Railway lines. There is an enormous area of land along these lines and on the coast which has everywhere been proved to be admirably adapted for cotton, and now is the time to seize the opportunity of utilising them in this direction.

COTTON IN TRINIDAD.

Much interest has been taken during the past year in the growth of cotton. A large quantity of seed was procured by the Government and distributed gratis to applicants.

Two hand-power roller gins were imported by the Government, and a hand baling-press is under way from England.* The use of these machines has been

* Received 28th March.

offered to the public free of charge, except for the motive power, and a convenient building has been provided at St. Clair for their working and storage. The machines are also offered to growers in the country free of charge, and under a caretaker and instructor, where there is sufficient cotton to warrant their transport.

Considerable areas have been planted with Sea Island cotton, but reports received of its growth are, for the greater part, unfavourable, owing to attacks of insects and disease. The native or Creole cotton, which is believed to be short-staple Upland, does not suffer so much from disease, and a sample was recently received coming from a single plant which weighed 1.71 lb. This gave on ginning .54 lb. of clean cotton. The sample was sent up by the warden of Tacarigua.

Of the Creole cotton there are several varieties, which appear to belong to the same class, but some of these have a much longer staple than others. A process of selection already initiated will probably give a cotton possessing stronger vitality than Sea Island, which appears at present to be highly susceptible to the attack of insects and disease; but it is hoped that with further experience of cultivation these drawbacks may be avoided. It is certainly yet too soon to speak positively on this point, as the variety has only been a few months under cultivation.

There is another acclimatised variety, called "Kidney cotton," which commonly appears self-sown in many districts of the island. This shows a coarse and hard lint with large seeds. In regard to this, a point may be mentioned. While this variety in the Experiment Station has been attacked severely by disease, a plant growing in a cottage garden close by is a picture of health and bears large quantities of cotton.

We have thus practically three varieties of cotton under cultivation:—

1. Sea Island.
2. Kidney Cotton.
3. Creole or Upland Cotton in several varieties.

The value of these has been stated as follows by good authority:—

Sea Island, 1s. 0½d. to 1s. 4d.—25c. to 32c.
Kidney Cotton, 5d. to 6d.—10c. to 12c.
Creole or Upland, 6d. to 8d.—12c. to 16c.

It is to be hoped that local growers will not be discouraged by the failures which generally accompany first attempts, but will give the industry more extended trial, especially the variety known as "Sea Island."

An attempt is being made to provide a depôt for the purchase of lots grown by small proprietors, as it is found that there is no inconsiderable difficulty in disposing of small quantities.

In Barbados, Sir D. Morris informs me that the local ginneries buy "really fine, well-picked Sea Island cotton, as obtained from the field, at 2d. per lb. This is seed cotton before it is ginned. This is equal to 9d. per lb. in Manchester for lint only. Inferior sorts are bought at 1d. per lb."—*Bulletin of Miscellaneous Information*, Trinidad.

The Cotton Supply.

Those who are wavering in their ideas concerning the future of cotton—that is to say, who are in doubt as to whether prices will keep up, or whether there will be such an over-supply that prices will recede to a non-paying point—may take heart of grace and plant with good prospects before them. The journal of the Jamaica Agricultural Society writes in the following prophetic and hopeful strain on the cotton prospects of the future:—

There never was a period in the history of cotton when the prospects of a great world shortage are so evident as now—a shortage, too, not like the one caused by the Civil War in the United States. Formerly it was almost wholly the county of Lancashire, in England, that consumed cotton. Now it still

takes as much as ever—or would, if it could get it. It is not through want of trade, but lack of supply, that the mills there have shut down; and Belgium, Germany, Italy, Japan, India, and the United States have all large cotton-manufacturing industries besides. The United States does not supply itself with just the varieties of cotton that we can grow best—viz., Sea Island and Egyptian. It imports from Egypt annually 7,500,000 dollars worth of cotton. Was there ever an industry with such a good chance—when the world gasps for supplies and cannot get them? Will the demand last? It is calculated that it will, for the United States are using more and more of their Upland cotton, while it is not probable that they will ever be able to grow all the Sea Island they require. A shortage for many years yet is in sight.

THE COTTON WORM.

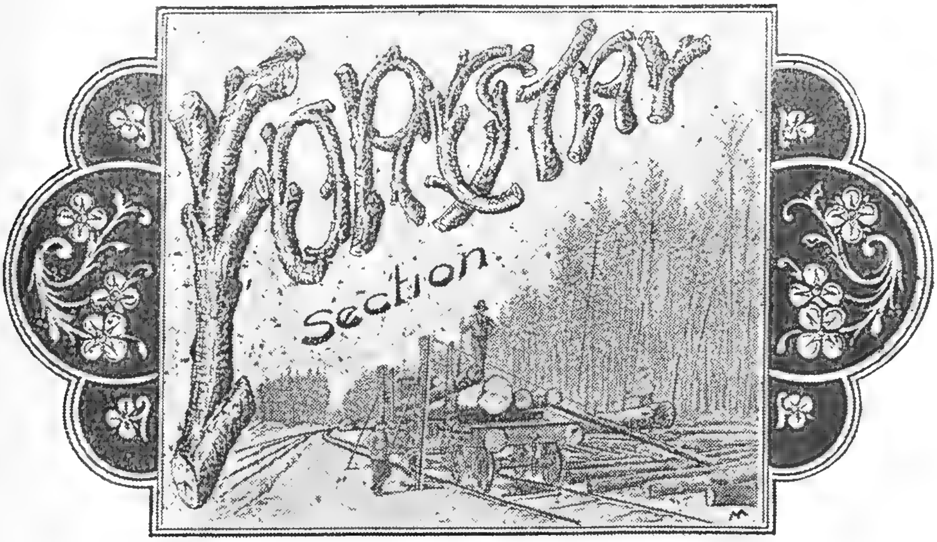
The *Agricultural News*, Barbados, gives some salutary advice to intending cotton-growers, the most important point of all being to prepare for the attacks of the cotton worm. This attacks cotton everywhere. It is proved, however, that the treatment with Paris green and lime is absolutely trustworthy, if applied in time. For every acre planted in cotton there should be kept at hand, ready for use for the cotton worm, at a moment's notice, at least 3 lb. of Paris green and 18 lb. of slaked lime; also, bags of coarse osnaburg for distributing the mixture, consisting of 1 part of Paris green to 6 parts of lime. Those who are prepared to carry out fully these suggestions and give close attention to the cultivation and care of their cotton-fields need have little or no anxiety as to the future of the cotton industry in these colonies.

ARROWROOT.

The arrowroot manufacturers of Queensland are all too well aware of the vexatious and absurd regulation under the British Food and Drugs Act which demands that Queensland arrowroot may only be sold in Great Britain if so labelled, the reason assigned being that the article made here is not genuine arrowroot because it is made from the *Canna edulis*, and not from *Maranta arundinacea*, from which the Bermuda arrowroot is made. Only a short time ago a London grocer was fined for selling Queensland arrowroot as genuine arrowroot. We learn from the *Chemist and Druggist* that trouble is looming ahead for some importers at home. That publication says:—"We understand that the public analysts are about to pay attention to arrowroot, and we should not be surprised to hear that some prosecutions are to take place shortly. It is reported that some of the importers of arrowroot have decided in future to sell the article 'guaranteed genuine as imported,' which 'guarantee' is not likely to avail the retailer much. That such a step should have been taken by the importers is evidence that developments may be expected. Chemists may also take the hint, so that when the ambitious inspector walks in they will be able to charge him 3s. 6d. or 4s. per lb. for 'the only genuine' Bermuda arrowroot."

POSSIBLE CURE FOR TICKS.

Mr. F. G. Walker writes:—"When at Burleigh Head lately with some friends, the conversation turned to the tick question. One of the party had never seen a tick, whereupon a bullock-driver who was present went to his team to get one or two. To his surprise, he could not find one, although the bullocks were previously covered with them. This man had been working his team in the salt water drawing timber logs from a raft. Anyone owning cattle near the coast should give this easy remedy a trial, and, if effective, should give it wide publicity."



Conducted by PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

SCIENTIFIC FOREST MANAGEMENT.

Extract from an address delivered at the annual meeting of the Queensland Acclimatisation Society by His Excellency Major-General Sir Herbert Charles Chermside, G.C.M.G., C.B., Governor of Queensland. (15th July, 1904.)

Whatever the land policy of a country may be, sooner or later its forestry policy must become an essential part of it. I recognise that this and kindred societies can, of course, exert far less direct influence on the treatment of the existing stand of timber on this continent generally, and in this State particularly, than on matters such as those which I have just mentioned [the acclimatisation of economic plants, fresh-water fish, and game]. In quality, there is the same knowledge of how matters stand—no more, no less, than elsewhere in the civilised world; but in the general average knowledge, perceptions, convictions on the subject, on the part of that public opinion on which the national policy must be based—and by which, whatever the actual laws and regulations, its success must be determined—the community is as deficient as those of past centuries, of past decades, in other lands. Actually, the inhabitants of this as of several other States in Australasia are proceeding to effect in a generation or two, without compensating advantage, mischief to a valuable asset of the national property which it will take centuries to repair. It is only some three years ago that a Royal Commission in one of the most important States of the Commonwealth characterised existing forest laws as "weak, unsystematic, and inefficient." It has been pointed out by a writer on forestry matters in U.S.A.* —himself a most influential lumber man, as it is there called—that, although the timber industry is only fourth in importance of all those in U.S.A., in spite of its having, in his judgment, done more for the development of the country than any other private enterprise except the railroads, yet that, as occurs in all other great private industries, the necessity for care has not been seen, until the harm has been done, and until the results of it are bitterly felt. An important feature of unsystematic timber-getting is, that while the increasing remoteness of supplies diminishes profits, and hampers the expansion of a trade,

* R. L. McCormick, President of the Mississippi Lumbermen's Association, and Secretary of Weyerhaeuser Timber Company.

which here might be so valuable, it is just in the neighbourhood of populous and industrial centres that the want of timber is most felt. In countries where scientific forestry—in the form of making the best permanent economic use of its timber tracts in order to furnish a continuous supply—has been practised for a century or more, we find just the converse, often to such a degree indeed that some of the best examples of forest management are to be found in the administration by municipalities of their own local supplies. Wasteful and improvident as have been hitherto the methods of timber-getting—the destruction being mainly limited by accessibility, and marked, as felling operations have been, by the systematic neglect of a first maxim of forestry—that timber should be cut in such a way as to avoid impairing the productive capacity of the forest—this havoc, nevertheless, has been quite insignificant compared to that of wholesale burning—intentional and accidental—and the ringbarking of valuable timber. I am glad to see that that admirable and most useful publication, the *Queensland Agricultural Journal*, now comprises a forestry section, and the two numbers of this hitherto issued well repay study. As far as can be estimated, in not more than two or three countries of the world is the growing crop of timber stationary or increasing. In all, where there is a large manufacturing population, the annual consumption of timber per head is rising, as well as its price, while many varieties, hitherto classed as of little commercial value, are now regularly exploited. The timber supply of this continent consists both of soft woods (the demand for which includes such a high percentage of the world's requirements) and of a notable variety of hardwoods. The principal divisions of trees of both natures, of commercial value, are eucalypts, casuarinas, conifers, and acacias. The former group, which comprises over 160 varieties, is remarkable for the fact of its members annually storing, in their growth of potentially calorific material, as large or larger percentage of the energy of the sun's rays as any on this globe, while there is none within its temperate zones with an equal capacity for rapid and cheap production of valuable hardwood. This genus, too, in the amount and distribution of which this State is so rich, has the characteristic of producing forest, the regeneration of which by natural means is exceedingly certain and regular. It is for the above reasons that in Asia, Africa, America, and tree-denuded parts of Europe the eucalypts, which are looked upon in Australia by the settler in his clearing operations, and in his hard struggle against the re-encroachment of the forest, as largely rubbish, are considered as the most promising timber for effecting reafforestation and the future maintenance of increased supplies. Australia has over 107,000,000 acres of woodlands which produce timber of commercial value, and over 200,000,000 acres more growing a large amount of trees useful for local purposes—building, fencing, packing, and firewood. Queensland heads the States of the Commonwealth with some estimated 10 per cent. of her vast surface included in woodlands of the former category, and an additional 25 per cent. in those of the latter. Every State, however, imports timber from Europe, United States of America, or New Zealand of an aggregate annual value of over £1,000,000. The balance of import over export is large. Three years ago I think it was over 140,000 tons. The large employment of steel and iron in manufacture and construction and in all modern industrial developments has not resulted in lessening the demand for timber. Railway and mining enterprise and every form of national activity are, on the contrary, annually calling for increasing quantities, both absolutely and relatively. The world's absorption of timber for sleepers alone is 3,240,000,000 cubic feet. These sleepers, which are of contents varying from $1\frac{3}{8}$ to 5 cubic feet each, require constant renewal. The progress of associated effort for the protection of forests is likely, judging from experience, to be slow at first. When irrigation becomes a vital factor of the internal economics of national policy, the sentiment for forest preservation, and the perception of its co-relation to settlement on the land (not only to the establishment of homes, but to the maintenance of them in prosperity), will show corresponding growth and power.

FORESTRY AND CLOSE SETTLEMENT.

By PHILIP MAC MAHON.

The problem of problems in the Commonwealth of Australia at the present moment is the settlement of a happy and industrious yeomanry on the fertile lands which fringe our island continent. "Tickle the land of Australia and it will laugh harvests," is as true to-day as when it was first written. But we want the man with the spade and plough to perform the tickling process, and we want to make sure that he shall have cheap and fertile land, and a certain hope of an adequate return for his years of pioneering toil. It is a little sad to reflect that the statesmen who may bend their energies to the realisation of this aspiration cannot hope to attain the fame and personal popularity of the man who may succeed in making a few hundred runs in first-class cricket, or even of a successful full-back at football. There might be more aspirants in the field if the market-place were thronged with patriots waiting to learn of their success, as they now await with bated breath to learn the latest score. There are nearly 3,000,000 square miles of land in the Commonwealth of Australia, and of these about 185,000 square miles have passed or are passing into the possession of persons or companies for agricultural and pastoral purposes. In addition, 1,170,000 square miles of country are leased for pastoral purposes mainly, leaving 1,617,000 square miles undealt with. Of course, of this much is desert, but still it represents a fair-sized nation. It is larger, for instance, than Argentina or the Turkish empire.

Table showing Areas of Australian States, Areas under Forest and Alienated or in Process of Alienation, and Percentages of Total Areas under Forest and Alienated.

State.	Area in Square Miles.	Area of Forest in Square Miles.	Area Alienated in Square Miles.	Percentage of Area under Forest.	Percentage of Area Alienated.
New South Wales	310,000	31,250	75,792	10.08	24.39
Victoria	87,884	18,750	37,590	21.33	42.77
Queensland	668,497	62,500	26,288	9.49	3.93
South Australia	903.690	6,250	22,199	.69	2.46
Western Australia	975,920	31,250	15,400	3.20	1.58
Australia	2,945,991	150,000	177,269	5.09	6.01
Tasmania	26.215	17,187	7.743	65 55	29.54
Commonwealth	2,972,206	167,187	185,012	5.32	6.22
New Zealand*	104,471	18,750	31,921	17.94	35.94
Australasia	3,076,677	185,937	216,933	6·04	7.23

It will be seen that there is room for forestry here. When I read recently, in the official publication of one of the States, that forest conservation and settlement cannot go hand in hand, I own to having experienced a feeling of surprise. The case of the Kingdom of Wurtemberg at once presented itself to the imagination. This State has an area of 7,528 square miles, the size of a large Queensland cattle run. It supports a population of 2,169,549, or 288 persons to the square mile. Of these, 40 per cent. are engaged in industrial pursuits, and 60 per cent. in agriculture, gardening, and grazing pursuits, mostly on small holdings. About half the total area is agricultural land. Meadows and grazing lands occupy 18 per cent. of the whole area. There is not a solitary pauper or "unemployed" in the whole nation. The revenue is £5,000,000, and the expenditure balances it. The yearly trade totals £349,000,000, or more than double that of all Australasia No room for forestry there, you will say. Now, rather more than one-third of the area of this

* I have taken the forest area of New Zealand from an official return furnished to the British Government some years ago. Later estimates seem to be somewhat overstated.

prosperous and closely-settled State is occupied by forests. But, like the land, the forests are closely settled—that is, closely settled with trees. A photographic illustration of one of these forests is shown below. (Fig. 1.) Compare it with the forests of Eastern Australia shown in Fig. 2.

Fig. 1.—Forest of Larch in Germany; 100 Years Old.

Trees from 100 to 120 ft. in height, averaging 1,200 superficial feet of splendid timber each. This shows the centre of the forest, the trees have just been cut from the bare patch in the foreground, harvested in fact, like a field of wheat. The foliage seen below is that of a dense crop of beech growing in the shade of the larch. (From a photograph by Simpson.)

A gentleman who has a most intimate and extensive knowledge of the forests of the eastern coast of Australia, Mr. J. McFarlane, M.L.A., speaking in his place in the Legislative Assembly of New South Wales, said that a very high average standard of hardwood would be 10,000 superficial feet, or 833 cubic feet, to the acre, and for pine 20,000 or 1,666 cubic feet. Let us say 800 cubic feet for hardwood and 1,500 cubic feet for pine. A very good hardwood tree will contain about 2,000 superficial feet, and this will give five trees to the acre, according to Mr. McFarlane's estimate.

Fig. 2.—A Forest Scene in Eastern Australia.

(From the Report of the Forestry Conference, Sydney, 1900.)

A short time ago an official estimate was made of the quantity of pine on certain reserves in Southern Queensland. The estimate was made by a careful man, having a good knowledge of the timber business, and he calculated that 10,672 acres bore 418,000,000 super. feet of pine, or 3,800 super. feet to the acre. This quantity would be about represented by two average trees to the acre.

The Wurtemberg forester has no land to spare for the purpose of growing from one to five trees to the acre, and he has no time to spare for making a little journey from one merchantable tree to another. No one has studied more closely the question of the espacement of timber trees than Dr. Schlich, the celebrated forester, at one time Inspector-General of Forests in India, and now Principal Professor of Forestry at the Indian Engineering College at Cooper's Hill, near London. He gives in the second volume of his classical work, the "Manual of Forestry," the first two columns of the following table. It shows the number of trees to the acre at various ages in such a forest as that shown in illustration No. 1. I have run out the espacements in the second and third columns to make it more clear to persons not accustomed to deal with land measurements:—

Table showing Number of Trees to the Acre in German Forests of Various Ages.

Age of Wood, in Years.	Number of Trees to the Acre.	Average Number of Square Feet to each Tree.	Average Distance Apart.
			Feet.
20	3,960	11	3.31
40	1,013	43	6.55
60	449	97	9.84
80	346	126	11.22
100	262	166	12.88

For some years the Government of the United States have been engaged in the endeavour to bring the forests of that country under proper sylvicultural conditions—conditions which will admit of the growth of timber in the same close manner as is illustrated in Fig. 1. The enormous economy in land, conservation expenses, and conversion is obvious, and appeals strongly to the practical American. The Dendrologist of the United States Government is an officer whose duty it is to study, under the direction of the Chief of the Forestry Department, the peculiarities of the trees of that region, their susceptibility to different climatic conditions, their capacity for enduring shade or their demand for sunshine, and all the other factors which form the basis of the science of forestry. This gentleman, Mr. G. B. Sudworth, obliges me with the following information relative to the number of trees which are grown under proper forest conditions on one acre of land. The word "tolerant" signifies a species which will grow well under the shade of other trees, and the word "intolerant" a species which demands for its well-being a large proportion of light. The difference between the two first tables and the last illustrates very clearly the great economic advantages and the enormous saving, when large areas have to be considered, which arise from the bringing of natural woodland under proper sylvicultural conditions:—

Number of Trees Grown to the Acre in America under Proper Forest Conditions and Systematic Management.

Tolerant Species, e.g. Beech—

Age. Years.	No. per Acre.
20	7,800
50	780
100	290
120	235

NUMBER OF TREES GROWN TO THE ACRE IN AMERICA UNDER PROPER FOREST CONDITIONS AND SYSTEMATIC MANAGEMENT—*continued.*

Intolerant Species, e.g. Oak—

Age. Years.	No. per Acre.
20	2,700
50	416
100	137
150	85

STAND ON NATURAL FOREST: TOLERANT AND INTOLERANT SPECIES NOT BROUGHT UNDER SYLVICULTURAL CONDITIONS.

Age. Years.	No. per Acre.
20	500
50	225
100	100
150	50

But it is not merely in the fact that from ten to twenty times the number of mature trees can be grown on the same area of land that the scientific forester scores. His timber will be straight and shapely. It will cut up without waste, and both the timber-getter and the sawmiller can deal with it with profit and satisfaction. To illustrate this, I show two pictures of oak-trees, grown for timber—Figs. 3 and 4. Fig. 3 is an oak-tree grown in a plantation thickly surrounded by other trees under proper sylvicultural conditions.

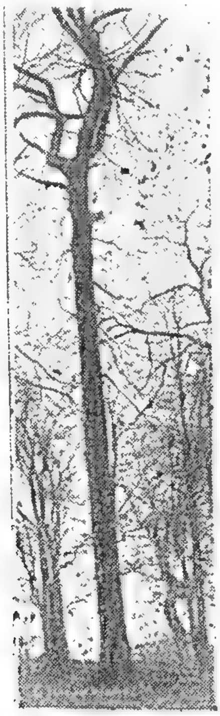


FIG. 3.—OAK-TREE.

Grown under proper sylvicultural conditions, having a height of 50 ft. to the top of the trunk, and containing 600 superficial feet of timber. (From a photograph after Simpson.)

When this tree shall have been cut down for timber, it may not be quite done with from the forester's point of view. A valuable crop of coppice poles

may be obtained from the old stump, which is always cut very low down. This is well shown in the next illustration—

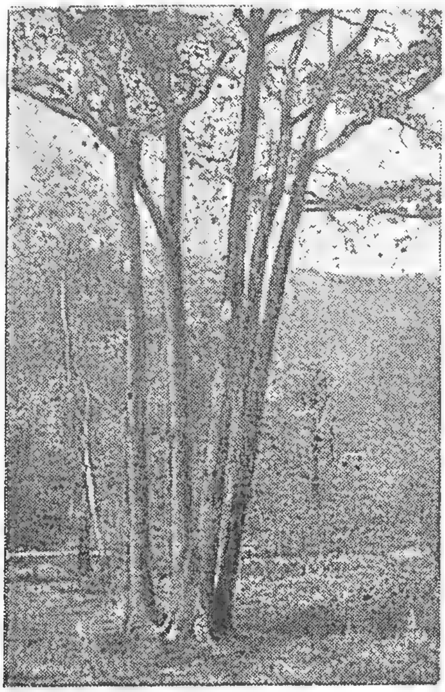


Fig. 4.—Group of Oak Poles from Coppice. (After Simpson.)

Dr. Schlich, the greatest authority on forestry in the world, estimated that the 10,000,000 loads of timber annually imported into Great Britain could be supplied by the forest grown on 6,000,000 acres. Assuming this estimate to be correct, and there is no reason to question it, the 350,000 loads annually imported into Australia, at a cost of over £1,000,000 sterling, could be supplied by the forest grown on a block 18 miles square! It is not a question of what land you nominally reserve for forestry, but of what timber you have upon it to the acre.

NOTES FROM THE DAINTREE.

Writing to the *Queenslander Herald*, Mr. J. T. Pentzcke complains of the apathy of the residents, who will not combine to send the district ahead. The trouble appears to be that there are large areas of land held by absentees. Seven thousand acres, he says, have been offered by the latter to the Government for cutting up into small farms; 10,000 more acres belong to a bank and to residents; and yet another 10,000 acres are lying unutilised in the Daintree River district, not as yet surveyed. The forests, he says, which cover some 50 miles square, contain beautiful little valleys suitable for gardens. Such forest land is the most profitable to work, and some day will prove a great blessing to the country. It would be best if a syndicate were to buy the land and its forests from the Government, and divide them for forest culture in the German fashion. Then, the many waterfalls in the district could be utilised, as

well as the 20 miles of navigable river, favoured by the flowing and ebbing tides, for the purpose of working sawmills, when casks, Austrian bent chairs, &c., could be manufactured on the spot. On the Daintree there are better timbers than in Germany—for instance, cedar, five varieties of Flindersia (crow's ash, stavewood, and yellow-wood), of better quality than the ash, several Proteaceas (oak) for cask-making, and several other varieties of useful trees. If a syndicate were at work now with sawmill and working bullocks, they could be reaping where they did not sow. As much as 200,000 feet of cedar have been felled here on 160 acres. Now 10s. per 100 superficial feet has to be paid to the Government as royalty. The writer has still £600 worth of cedar standing on 50 acres, but can make no use of it, owing to the want of a mill and draught bullocks. One of the cedars, which twenty years ago contained 1,000 feet of timber, now contains 5,000 feet. On an average, one may reckon on an increase in diameter of cedar-trees of 1 foot in twelve years or 1 inch per annum, making the value of the tree £25, besides the profit after sawing it up. Germans, who understand forestry, would have to work here as in Germany—that is, carry on farming and forestry together—and take out all old timber, and at once replant with cedars and trees of equal growth, such as teak and Flindersias. Forty cedar, teak, or Flindersia trees to the acre is sufficiently close planting to ensure a good height-growth. In thirty years half the teak could be taken out and sold for spars. A great point in favour of the Daintree forests is that they are fireproof, and will not burn until the felled timber is dry. Sloping land on the river would be very suitable for agriculture, but as soon as it has been cleared the heavy rainfall (100 inches annually) causes it to slip, and the level land is covered with stones and gravel, so that it is better to let the dense scrubs stand.

PICKLING ONIONS.

To pickle onions cold, scald the onions and skin them. Next place them on a dish and sprinkle with salt, afterwards letting them stand for two or three days. Dry the onions thoroughly and place them in jars and cover with vinegar, to which has been added a little sugar (not too much, or the onions will be too soft) and pepper, peppercorns, bruised ginger, mace, and cloves. The pickles must stand several weeks before they are ready for use when pickled in cold vinegar.

Hot Pickling.—Scald and skin the onions and let them lie in a brine of salt and water for a few days. Drain the onions and dry them thoroughly, place in jars, and pour over them boiling vinegar in which has been boiled the spices—ginger, peppercorns, mace, cloves, and pepper. The pickles should be ready for use in a few days.

CASTOR OIL SEED.

We have on several occasions written on the subject of the castor oil plant as a possible subsidiary crop which would pay farmers to grow. Now, the Jamaica *Leader* is urging the peasantry to grow castor oil plants. A local soap factory, which has for some years been using cocoanuts through inability to obtain castor oil seeds, and which is at present unable to buy cocoanuts on account of the hurricane, is now offering 4s. a bushel, or 8s. 4d. per 100 lb., for castor oil seeds. It is pointed out that these might be produced in preference to corn. The oil nut plant bears soon and goes on bearing for several years without replanting.

Vegetable Pathology.

SOME DISEASES OF THE POTATO.

The following is an abstract of a lecture delivered by Mr. George Massee before a meeting of the Royal Horticultural Society, on Tuesday last, 19th April. The summary is from the *Gardeners' Chronicle*, in which a series of illustrations is given, showing the effects of the various diseases described:—

Phytophthora infestans (De Bary).

This disease is so well known that, unfortunately, little can at present be added to our knowledge of it. Extended experiments, such as might be carried out under the auspices of the Royal Horticultural Society, are still needed to demonstrate clearly the sources of infection. Opinions differ as to whether young potatoes can be infected directly by spores carried into the soil by rain, &c. Some authorities do not admit the usually accepted statement that the mycelium spawn passes up from diseased seed potatoes into the foliage. Experiments conducted at Kew prove that in some instances this does occur, even when the potatoes are only very slightly diseased.

It is perhaps not stating too much to say that a very large percentage of of disease is due to two specific causes, both of which could be prevented. Unfortunately, the means of prevention do not generally commend themselves to the majority of potato-growers. I have observed the important fact that when diseased potatoes are planted, after the crop has been lifted, the remains of the old seed potatoes, when brought to the surface of the ground, will produce a crop of fungus bearing myriads of spores. If such old seed potatoes are kept buried in soil until the following year, and then exposed to light under favourable conditions, fungus fruit is still produced, and continues to grow so long as a scrap of the old potato remains. I have now in the laboratory at Kew Gardens scraps of last year's seed potatoes covered with the fungus, and with the spores thus produced have successfully inoculated the leaves of young plants.

It is not rare to see in horticultural periodicals statements to the effect that 10 acres of badly diseased potatoes were ploughed in, not being considered worth lifting. Now, in face of the above statement as to the copious growth of the fungus on diseased potatoes when exposed to the air, it is not difficult to understand where the germs that first infest a crop come from, and, with the well-known necessary conditions of moisture and warmth, an epidemic breaks out at once. Lacking such necessary conditions, the fungus, although present, cannot attack the potato leaves; hence the absence of disease does not necessarily prove the absence of the fungus, but only the absence of those conditions necessary to enable the fungus to attack its host. In all probability the fungus is always present in land where potatoes are grown at short intervals.

I can realise the thoughts of the practical man on being told that it is as important to collect the old "sets," or the whole of a crop of diseased potatoes, as it is to gather the sound ones. Nevertheless such is the fact; and, although at first sight such work might appear not to pay, it would eventually do so.

A second very fertile source of disease is due to planting infected potatoes. Perhaps no one would plant obviously diseased "sets," but the danger arises when the potatoes exhibit none of the external signs of disease, but when cut just show indications of the discoloured patches characteristic of the presence of the fungus. The obvious check to this source of danger is to cut all potatoes used for planting, refusing those suspected of being diseased.

Winter-Rot (*Nectria solani*, Pers.),

one of the commonest of diseases attacking stored potatoes, but not as a rule manifesting itself for some weeks after the potatoes have been piled in a heap, is rarely, if ever, met with on potatoes that are kept dry and exposed to the air, whereas, when stored before being perfectly dry, sweating takes place, and in some instances a very large percentage becomes thoroughly rotten before the spring.

The first outward indication of the disease is the appearance of scattered white warts bursting through the skin of the potato; these, when examined under the microscope, are seen to be covered with a minute mould-like form of fruit once considered as an independent fungus called Monosporium. At a later stage the same warts change to a pale rose-pink colour, and a second form of fruit appears, the so-called *Fusarium solani*. The spores of the Fusarium on germination yield a third type of spore, produced in a ball-like mass of gelatine, which in turn was at one time supposed to be an independent fungus called Cephalosporium. Each kind of spore in turn is capable of reproducing the fungus, the spores being carried by the numerous mites and other forms of animal life in heaps of stored potatoes.

The last and most perfect form of fruit produced from the warts are minute blood-red flask-shaped bodies: but these only appear on old dried-up scraps of potato-skin that are thrown away and lie exposed to the open air. This is the Nectria condition of the fungus, the spores of which on germination produce the Cephalosporium forms of fruit. These spores in turn start the first infection in other heaps of stored potatoes.

The best preventive against winter-rot is to have the potatoes thoroughly dry, and then well sprinkled over with powdered sulphur before storing. The sulphur not only destroys the germinating fungus spores, but also checks the development of mites and other minute animals which convey the spores from one potato to another.

Black Scab (*Œdomyces leproides*, Trabut).

This serious pest, although only quite recently imported from the Continent, threatens to be quite as destructive to potatoes as the old-established disease. It has also been called *Chrysophlyctis endobiotica*.

The young "sprouts" are first attacked, presenting a dark-brown colour; as these continue to grow they become contorted and much thickened, forming thick crusts of a blackish hue with projecting points, and wrinkled on the surface like a broccoli flower. After a time the fungus spreads along the surface, and meeting other diseased sprouts, the greater portion of the surface of the potato becomes covered with an irregular blackish scab.

When diseased potatoes are allowed to decay on the ground, the liberated spores live in the soil and infect potatoes the following year.

Experiments conducted at Kew prove that if seed potatoes are thoroughly well covered with powdered sulphur just before planting they are not attacked when planted in soil known to be infected; but the young potatoes are attacked under such circumstances; whereas, if the soil is intimately mixed with sulphur, both "set" and young potatoes are protected.

It may not be practicable to mix sulphur with the soil on a large scale; nevertheless the fact is worth recording. Gas-lime also kills the fungus in the soil if worked in about May or June, when the fungus is in a very susceptible condition. At other seasons of the year gas-lime is of no value in this respect. The only practicable means of preventing the spread of this disease is to carefully avoid infecting the soil, and this means the removal and burning of all diseased potatoes: at the same time being careful not to plant slightly diseased "sets," known by the blackening at the base of the young sprouts.

Bacterial Disease (*Bacillus solanacearum*, Smith).

This disease, which has proved very destructive to potatoes in the United States, has occurred once or twice in this country. The leaves wilt and die, the stem changes colour and shows black streaks. When a diseased tuber is cut across, a dark ring, more or less intense, depending on the progress of the disease, is present some little distance from the outside.

Potato Scab (*Sorosporium scabies*, Fisch).

This disease, characterised by the presence of scurvy or scab-like patches on the skin of the potato, is very prevalent during certain seasons, and, although the edible property of the tuber is not injured, the market value is much depreciated. A second form of scab, superficially resembling the one described above, caused by an organism called *Oospora scabies*, Thax., also occurs.

The disease is prevented in both cases by steeping seed potatoes for two hours in half a pint of formalin mixed with fifteen gallons of water.

Times of Sunrise and Sunset, 1904.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·11	6·16	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

Phases of the Moon.

			H.	M.	
7 May	☾	Last Quarter	9	50	p.m.
15 „	●	New Moon	8	58	„
22 „	☽	First Quarter	8	18	„
29 „	○	Full Moon	6	54	„
6 June	☾	Last Quarter	3	52	p.m.
14 „	●	New Moon	7	10	a.m.
21 „	☽	First Quarter	1	10	„
28 „	○	Full Moon	6	23	„
6 July	☾	Last Quarter	8	54	a.m.
13 „	●	New Moon	3	27	p.m.
20 „	☽	First Quarter	6	48	a.m.
27 „	○	Full Moon	7	41	p.m.
4 Aug	☾	Last Quarter	12	2	p.m.
11 „	●	New Moon	10	58	„
18 „	☽	First Quarter	2	27	„
26 „	○	Full Moon	11	2	a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1904.		Rockhampton.		Townsville.		Cooktown.	
		Rise.	Set.	Rise.	Set.	Rise.	Set.
May	...	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	...	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	...	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	...	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1903.							1904.					
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
North.													
Bowen	2·77	0·31	0·22	0·51	1·36	3·14	6·13	3·45	2·65	1·12	0·31	0·25	0·30
Cairns	0·51	0·87	0·44	0·47	0·91	3·10	13·51	10·03	10·55	15·73	13·33	3·21	Nil
Geraldton	3·42	2·07	7·08	3·79	3·05	7·13	37·86	24·37	14·04	31·09	38·73	11·81	0·39
Herberton	1·00	0·19	0·33	Nil.	0·67	6·21	15·52	8·01	5·16	18·25	7·08	1·55	Nil
Hughenden	Nil.	0·07	0·31	0·65	0·80	2·36	5·30	2·71	2·80	1·93	1·36	0·07	0·44
Kamerunga	0·50	1·10	1·50	0·86	1·39	4·94	14 33	7·37	9·39	22·35	15·48	3·50	Nil
Longreach	Nil.	0·69	Nil.	1·58	0·90	0·83	1·76	1·77	2·69	1·01	0·31	2·78	0·04
Lucinda	2·44	2·38	4·39	0·30	0·76	10·67	40·31	11·71	8·40	22·10	11·30	4·00	Nil
Mackay	2·49	2·53	0·59	0·44	1·54	9·86	5·52	16·74	3·17	5·69	5·24	3·61	0·93
Rockhampton	0·08	3·73	0·68	0·54	1·84	7·42	4·08	5·12	3·50	5·11	13·82	0·77	1·26
Townsville	1·02	0·05	0·19	0·44	2·42	5·97	19·02*	5·48	5·19	4·01	1·03	0·24	0·04
South.													
Barcaldine	Nil.	0·93	0·50	4·23	1·01	4·00	0·92	3·26	0·96	0·11	1·19	3·85	0·16
Beenleigh	0·92	5·04	2·26	4·13	3·29	4·78	1·69	2·81	1·25	8·06	14·99	6·17	0·15
Biggenden	2·07	3·90	1·62	2·23	2·77	4·37	5·62	7·48	0·71	3·16	2·92	2·29	0·71
Blackall	Nil.	1·81	0·75	2·25	0·45	2·56	1·79	2·28	3·67	0·39	3·76	3·08	0·32
Brisbane	0·73	5·56	3·84	4·73	3 65	3·98	2·19	2·65	0·77	7·07	7·23	4·04	0·59
Bundaberg	0·33	5·98	0·88	3·55	0·43	3·25	9·97	3·18	0·85	4·26	5·64	1·32	0·86
Caboolture	0·92	6·08	3·27	4·41	3·11	9·98	4·18	4·29	1·32	8·48	9·90	4·66	0·17
Charleville	0·02	1·61	0·62	3·40	0·95	2·20	2·98	1·87	2·56	4·60	3·62	3·07	0·31
Dalby	0·03	3·78	2·30	3·30	3·12	6·30	1·19	1·88	3·20	4·74	0·40	4·69	0·34
Emerald	0·02	0·57	0·24	1·28	1·90	2·21	4·30	2·70	1·26	4·14	5·88	1·23	0·96
Esk	0·30	2·97	4·21	4·86	3·69	4·02	1·43	2·37	1·86	3·18	4·91	3·99	0·20
Gatton College ...	0·17	4·15	2·50	3·56	4·71	5·05	1·04	2·15	1·20	4·17	2·59	3·79	0·45
Gayndah	0·05	2·81	1·06	2·62	4·37	3·03	5·12	7·01	1·83	2·97	1·63	1·61	0·93
Gindie	Nil.	0·51	0·30	1·58	1·97	4·06	4·26	1·52	1·40	1·83	4·81	1·65	0·43
Goondiwindi	0·15	4·38	2·09	4·22	2·16	3·73	3·62	2 90	2 65	7·32	0·37	3·40	0·49
Gympie	0·62	1·67	2·72	2·42	5·61	4·50	4·88	9·27	1·80	3·32	10·86	4·11	0·60
Ipswich	0·85	3·64	2·70	5·24	2·98	3·84	1·01	4·07	1·72	3·55	4·71	3·50	0·23
Laidley	0·20	4·65	3·06	4·25	5·47	3·37	1·82	2·93	1·35	5·36	2·83	3·12	0·32
Maryborough	1·60	6·17	1·09	1·83	2 62	3·96	5·04	2·64	0·56	3·94	10·07	4·42	1·37
Nambour	1·29	5·38	3·95	3·61	3·85	6·13	2·43	6·39	1·91	10·30	15·43	6·94	0·32
Nerang	2·36	7·34	2·21	3·81	3·52	3·86	4·24	3·89	0·85	11·18	13·83	7·52	0·19
Roma	0·34	2·26	1·13	6·61	1·92	3·16	4·21	1·85	0·59	2·32	5·06	3·73	0·20
Stanthorpe	0·74	4·71	1·98	6·07	3·45	4·45	2·59	2·29	1·33	6·57	0·71	4·11	0·66
Tambo	0·01	2·64	0·27	4·33	1·08	3·17	2·91	2·48	1·72	1·26	5·46	3 96	0·28
Taroom	0·23	3·83	2·21	1·51	2·05	3·76	3·22	1·39	2·79	1·58	2·21	3·49	0·54
Tewantin	7·42	7·09	5·70	5·80	2·85	9·85	1·37	3·03	2·59	19·55	30·39	9·20	0·21
Texas	0·36	4 53	3·21	1·55	2·47	4·83	4·44	1·70	3·67	5·72	0·03	2·99	0·70
Toowoomba	0·34	3·90	3·00	4·06	3·82	4·85	4·27	4·26	3·98	4·76	3·29	4·08	0·38
Warwick	0 10	5·45	2·63	3·41	2·89	3·92	2·73	0·60	2·91	5·74	0·66	2·85	0·53
Westbrook	2·53	3·89	1·63	3·89	4 03	5·11	3·75	1·46	2·82	3·49	9·00	3·18	0·22

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian, 80s. to 88s; Danish, 91s. to 95s.; New Zealand, 86s. to 88s. per cwt. The butter exported from Queensland to London, South Africa, and other ports during the ten months ending 31st May, 1904, amounted to 99,116 boxes.

CHEESE.—Canadian, 45s. to 47s.; New Zealand, 43s. to 45s. per cwt.

CONDENSED MILK.—16s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ½ per cent.).—Refined, £17 to £19; raw, £11 10s. to £15 per ton; German beet, 88 per cent., 9s. 4¾d. per cwt.

Molasses (duty, 2s. per cwt. and ¼ per cent.).—4s. 6d. to 8s. 6d. per cwt.

Rice.—Rangoon, £7 15s. to £12; Japan, £13 to £17; Java, £17 to £21; Patna, £15 to £18 per ton.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 110s. to 130s.; peaberry, 60s. to 120s.; Santos, 28s. to 46s.; Mocha, 60s. to 90s.; Jamaica, 100s. to 125s. per cwt.

Chicory Root, dried (duty paid).—24s. to 25s. per cwt.

Arrowroot.—St. Vincent, 1¾d. to 3d.; Natal, 5¾d. to 7d.; Bermuda, 1s. 2d. to 1s. 5d. per lb.

Wheat.—Duluth, 30s. 6d. to 31s. per 496 lb.; English, 27s. 6d. to 29s. 6d. per 504 lb.; Australian, 30s. 3d. to 31s. 3d. per 480 lb.=3s. 9¼d. to 3s. 11d. per bushel.

Flour.—27s. to 31s. per 280 lb.

Malting Barley.—27s. to 29s. per 448 lb.; grinding, 21s. to 41s. (Chevalier) per 416 lb.

Oats.—New Zealand, 23s. to 24s. per 384 lb.

Split Peas.—38s. to 48s. per 504 lb.

Ginger.—Jamaica, 50s. to 57s.; Cochin, 58s. to 65s.; Japan, 22s. to 23s. per cwt.

Vanilla.—3s. to 7s. per lb.

Pepper.—Capsicums, 14s. to 65s.; chillies, 45s. to 50s. per cwt.; black, 5⅝d. to 6d.; white, 8¼d. to 8½d. per lb.

Green Fruit.—Apples: American, 12s. to 15s.; Australian (average), 4s. to 7s. 3d.; Tasmanian, 7s. to 11s.; South Australian, 6s. to 9s. per case; bananas, 6s. to 11s. per bunch; pineapples, 2s. 9d. to 5s. 6d. each; oranges, Valencia, per 420, common, 9s. 6d. to 11s.; medium, 13s. to 16s.; fine selected, 17s. to 22s.; finest selected, 24s. to 36s.; lemons, Messina, per 360, finest selected, 9s. to 10s.; ordinary to fine, 3s. to 8s.

Dates.—Tafilat, none; Egyptian, 11s. to 15s. per cwt.; Persian, 5s. 6d. to 9s. per case.

Cotton.—Uplands, 7d. to 8½d.; Sea Island, 1s. 2d. to 1s. 8d. per lb.

Cotton Seed.—£5 10s. to £5 15s. per ton.

Cotton-seed Oil.—Crude, £16 5s. to £16 10s.; refined, £17 to £19 10s. per ton.

Cotton-seed Oil Cake.—£4 5s. (undecorticated), to £7 10s. (decorticated) per ton.

Linseed.—30s. to 44s. per 416 lb.

Linseed Oil.—£15 to £15 15s. per ton.

Linseed Oil Cake.—£6 5s. to £6 7s. 6d. per ton.

Olive Oil.—£30 to £40 per tun (252 gallons).

Copra (cocoanut-kernel).—£16 to £16 10s. per ton; £8 to £9 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

Cocoanut Oil.—£28 to £31 per ton.

Beeswax.—Australian, £7 2s. 6d. to £7 5s. per cwt.

Lucerne Seed.—60s. to 70s. per cwt.

Canary Seed.—56s. to 76s. per quarter of 480 lb.=7s. to 9s. 6d. per bushel.

Manilla Hemp.—£30 to £35 per ton.

Sisal Hemp.—£35 per ton. Sales were made during the year in the United States of Yucatan sisal at £40 6s. 8d. per ton.

New Zealand Hemp.—£29 per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—2¾d. to 5d. per lb.; pearl, 11s. to 14s. per cwt.

Eggs.—French, 9s. to 9s. 6d.; Danish, 6s. 9d. to 8s. 9d. per 120.

BACON.—Irish, 56s. to 65s.; American, 36s. to 48s.; Canadian, 51s. to 55s. per cwt.

HAMS.—Irish, 74s. to 92s.; American, 44s. to 49s. per cwt.

TALLOW.—Mutton, fine, 24s. to 26s.; medium, 23s. to 24s.; beef, fine, 23s. 6d. to 24s. 6d.; medium, 20s. 9d. to 22s. 9d. per cwt.

GOATSKINS.—Cape, from extra light to heavy, 9d. to 15½d.; Angora, light to heavy, 5d. to 7½d.; Natal, goat and Angora, 1¾d. to 8d. per lb.

POULTRY (Smithfield).—Yorkshire, 3s. to 3s. 6d.; Essex, 3s. 3d. to 3s. 6d.; Boston, 2s. 6d. to 3s.; Surrey, 3s. 9d. to 4s. 6d.; Sussex, 3s. 6d. to 4s.; Welsh, 2s. 6d. to 3s.; Irish, 2s. 3d. to 2s. 9d. per pair; turkeys (cocks) 6s. to 8s., (hens) 4s. 6d. to 5s.; goslings, 3s. 6d. to 4s. 6d.; country ducks, 2s. 6d. to 2s. 9d. per pair; rabbits, 6d. to 8d. each; Australian rabbits, 6s. to 8s. 6d. per dozen.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.
(Crossbred Wethers and Maiden Ewes.)

	July 16.	July 23.
Canterbury, light (48 lb. to 56 lb.)	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Dunedin and Southland (56 lb. to 64 lb.)	4d.	$4\frac{1}{16}$d.
North Island (56 lb. to 65 lb.), ordinary	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
North Island, best	$3\frac{15}{16}$d.	4d.

Australian Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	None offering.	
Light (under 50 lb.)	None offering.	

River Plate Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
Light (under 50 lb.)	$3\frac{11}{16}$d.	$3\frac{11}{16}$d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36lb.), new season's	$5\frac{5}{8}$d.	$5\frac{1}{8}$d.
Canterbury, heavy (36lb. to 42lb.), new season's	$5\frac{5}{8}$d.	$5\frac{11}{16}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{5}{8}$d.	$5\frac{11}{16}$d.
North Island (28 lb. to 42 lb.) ...	$5\frac{9}{16}$d.	$5\frac{5}{8}$d.

Australian Lambs.

30 lb. to 40 lb.	None offering.	

River Plate Lambs.

30 lb. to 40 lb.	None offering.	

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$3\frac{1}{4}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$4\frac{3}{8}$d.	$5\frac{1}{4}$d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	$2\frac{3}{8}$d.	3d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{3}{4}$d.	$4\frac{1}{2}$d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	3d.
Ox, hinds (160 lb. to 220 lb.) ...	4d.	5d.

General Notes.

PICKLING OLIVES.

In many parts of Queensland there are farmers and others who have a few olive-trees in bearing. We believe, however, that, with the exception of the olive grove at the St. Helena Penal Establishment, there are nowhere sufficient trees to warrant the establishment of an oil press. Why not, then, pickle them? There is a good demand for pickled olives, all of which have to be imported. If our people can excel, as they do, in making home-made jam, jellies, sauces, and vegetable pickles, there is no reason why they should not be equally successful in pickling olives. In February, 1900, we gave directions for the process, and it is now time to point the way once more. We therefore take from *Garden and Field* the following excellent paper on the pickling of ripe olives, by B. M. Lelong, of California, which has just been published in that journal:—

This paper, on the use of olives in small lots, was suggested by numerous letters, asking as to what use could be made of olives where small quantities only are grown. In many such places the trees are planted without regard to variety, as the trees were to be ornamental only. The consequence is that while they serve the purpose well as ornaments they have also borne fruit which should be utilised and not allowed to go to waste.

To pickle olives ripe or in the black state, we must be sure that the variety will stand the treatment, and at the same time be of such quality as will keep after pickling. Many of the largest size olives contain very little oil, and are more adapted to being pickled green. One season's experience will establish the varieties that will undergo the pickling treatment and are most favourable to the palate.

Crockery or agate jars of 3 or 5 gallons are among the best utensils for pickling olives in a small way, as follows:—Take ½-lb. of commercial potash (98 per cent.), and dissolve in a quart or so of water; then add water to make in all 5 gallons of solution; place the olives in the jar, filling half or three-quarters full; then cover the fruit with the solution, and let stand from 6 to 10 hours.

Throw out the lye solution and fill jar with fresh water, and keep changing the water for two days. The berries will still be bitter, but sound. Throw out the water and fill up with lye solution as at first, and, after standing from 6 to 10 hours, throw out the lye solution, and fill up with fresh water, and keep changing for two or more days. If the olives are still bitter, repeat the lye operation, but this is seldom required to be done more than twice. After changing with fresh water for two or more days, they are ready to be put into brine.

The first brine is made of 4 oz. salt to the gallon of water, which is quite weak, and so made to prevent the olives from shrivelling. The second brine is made of 8 oz. to the gallon of water, and the third 14 oz., which are applied at intervals of about a week or ten days; thus the brine is increased to its full required strength without injury to the fruit.

In the process for pickling olives on a large scale I allow the fruit to stand in the lye only four hours, and great precautions must be taken, but in small lots there is no possible danger by leaving them in the lye a longer time.

The preparation of the brine is the key to the whole operation of picking ripe olives in such a way that they will keep.

The brine must be put on boiling hot, and must be properly prepared. To do this, boil the water containing the amounts of salt above stated, skimming it frequently until the liquid shows clear and no more scum rises to the surface. This may require an hour or longer, but when the proper condition

of clearness is reached the brine should be put away in a tank for four or five days to settle. It is then poured off and heated for use, being applied hot, as above stated.

The olives are then ready for permanent preservation in brine, which is made as follows:—Kitchen salt is mixed with water until the solution is saturated, and an excess of salt falls to the bottom. The saturated solution is then poured away from the undissolved salt into another receptacle, and added to twice its volume of pure water. In this solution the olives are placed in barrels ready for the market, care being taken to keep the olives well covered with the solution. The exact salt strength of this solution may vary a little with the taste of the people using it, but that given is the usual strength in Tuscany. This is the method of preserving the large Tuscan olives, which are the best in the world.

The length of time the olives will keep good in the brine cannot be ascertained, but twelve months may be put as the minimum period. They are, however, never kept long in Italy, because there is such a great demand for them that they are always sold practically before the season is closed. Two or three months after they are pickled there is not a barrel to be had. The demand for olives preserved in this way and of the size and character sent to South Australia is really unlimited.

The following notes have been kindly furnished by an old hand at pickling olives:—

You had some recipes for curing green and ripe olives in your last week's number. More simple and yet equally useful ways are better suited to the generality of people, for I frequently read in the papers the recipes of theoretical scientists as to an amateur carpenter, "How to Drive a Tin Tack with a Sledge Hammer," when a lighter tool would better answer the purpose.

Pickling Green Olives.

This requires much practice, and is not so easy as learning to suck eggs. The olives must be fully developed, yet perfectly green, for if at all coloured they will go soft. There are several recipes for extracting the bitterness, as caustic soda, bicarbonate of potash, &c., but the use of these chemicals requires experience and causes many failures.

Wood ashes, particularly those of fruit trees, are used as a lye, and the best are those from vine cuttings. I have used mangrove ashes, which are very strong in potash, but the simplest method is to make fresh limewater about the appearance of skim milk, and to soak the olives in it for a fortnight or three weeks, changing it, say, twice a week; then put them in fresh water for a fortnight, changing the water every two or three days. Then put the olives in bottles or jars, and make a brine like sea-water.

Buy a bottle of French or Spanish olives, and make the brine of similar strength.

If the olives are wanted to be flavoured, when boiling the brine put in a few bay leaves, sweet herbs, a little spice, and black pepper, and when cold fill up the bottles or jars.

When picking the olives they should be all of one sort, and, if possible, off one tree, for there is a great difference in the bitterness of various sorts, and I have some that, when ripe, can be eaten like black currants, whereas some sorts are extremely bitter, and therefore require longer treatment in the lye.

The country people in Spain put the green olives in baskets and stand it in a running stream coming from limestone country, like the Torrens, and the bitterness is cleared from the fruit in about three weeks, and it is ready at once to put in the brine.

To Preserve Ripe Olives.

Nothing is simpler. Take olives perfectly ripe, put them in a jar with alternate layers of salt, top the jars with salt, and let stand for a month or two, when all the bitterness with the watery juice, of wine colour, will have been extracted.

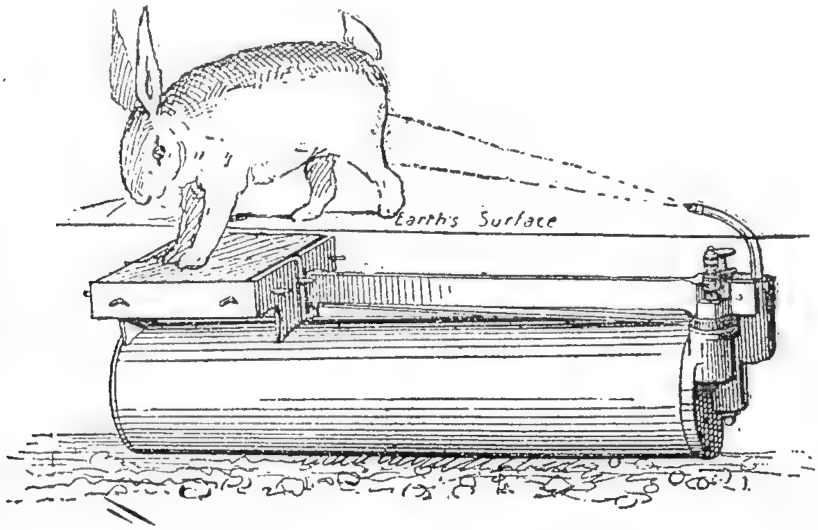
For cooking purposes they can be left in their own brine, and when wanted for use taken out and rinsed to remove the superfluous salt; but if wanted for eating with bread, &c., they should be taken out and rinsed. Then make a brine like sea-water, adding bay leaves, spice, sweet herbs, and black pepper, and when cold fill up the jars or bottles.

Before putting into the jars they may be soaked a week or two in wine vinegar, then put in a cloth and gently shaken to dry them, and then, instead of brine, put into best olive oil.

For cooking purposes salted olives may be dried and pressed into cakes, like dates, but after a time the oil in them becomes rather too rank for a delicate palate.

THE PARKER RABBIT EXTERMINATOR.

In a former issue of the *Journal* we briefly described an ingenious device, the invention of Messrs. Parker Bros., Victoria, for the destruction of rabbits. We take from the *Australasian* of 14th May the accompanying illustration of the apparatus and its action. A second illustration, not reproduced here, shows the result of a demonstration of the working of the machine near Swan Hill. The machines were set for one night in a furrow 300 yards long, and it was estimated that fully 300 rabbits were destroyed.



The Parker rabbit exterminator is an ingenious automatic machine, designed for the wholesale destruction of rabbits. It is of simple construction, and made of rust-resisting metals. The pastoralists and experts who witnessed the field demonstrations given were unanimous in declaring it to be the most perfect means yet invented for the extirpation of rabbits, and the one most likely to reduce the pest in the Australian States to a minimum.

Briefly, the machine consists of a cylinder, to which are attached a valve and nozzel. Connected with the valve is a small brass shaft, and to the end a platform is fastened, similar to that of an ordinary steel rabbit trap. The cylinder holds about a quart of slightly sticky poisonous solution, and a quantity of air is pumped into it with an ordinary bicycle pump.

Now it is well known that for some reason all rabbits in the neighbourhood of a newly-made scratch or furrow will run along it at night. The Parker machine is, therefore, buried in the earth (nothing being visible except the tip of the nozzle), in such a position as the rabbits following the furrow must pass over its hidden platform.

Immediately the platform is trodden upon a double jet of the poisonous solution is ejected with great force from the nozzle on to the fur of the rabbit, and the machine is ready in an instant to treat the next comer in a like manner. The action of the machine is silent, and the rabbit passes on unaware of what has happened, but, soon discovering some objectionable matter upon its fur, licks it off and dies.

One charging of the cylinder provides at least 300 squirts, and the machine, once set, requires no further attention until the whole of its contents are exhausted.

Mr. George H. Day (H. Byron Moore, Somerville, and Day), 367 Collins street, Melbourne, is secretary to the company.

DYED JAM.

Never before was there so much dyed jam on sale in England as at present. As the result of the phenomenal development of aniline dye production in German chemical factories, the use of these dyes generally is extending rapidly every year.—*Newcastle Chronicle.*

CHATEAU STOKE NEWINGTON.

Champagne at 21s. a dozen is openly made and sold within a few miles of London, and circulars offering claret (?) at 6s. a dozen are passing through the post in thousands.—*The World.*

CASSAVA STARCH FACTORY.

A 100,000-dollar cassava starch factory is to be built at Lake City, Florida, by a Chicago firm. The citizens of the town provided the site and subscribed for a large block of stock. The mill will have a daily capacity of 120 tons of raw material, and is expected to be a great aid to farmers in the locality by furnishing a market for cassava roots.—*Experiment Station Record*, Vol. XV., No. 7.

AN ENEMY OF THE BOLL WORM.

It is announced by the United States Department of Agriculture that Mr. Cook, the botanist, during his journeys in the province of Alta Verapez, Guatemala, discovered an ant which is an effective enemy to the boll weevil. This ant will at once be introduced into the cotton-producing States.

THE AMERICAN COTTON CROP.

The area under cotton in the United States of America is about 30,000,000 acres, and the crop promises to turn out between 10,000,000 or 11,000,000 bales, whilst next year there will probably be 15,000,000 bales produced. The price for July was 7.53d. per lb. for Uplands. The great increase of cotton-mills in the United States and consequent decreased exports make it imperative that strenuous exertions should be used throughout the British Empire to render Lancashire independent of the American cotton supply.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

HUSKING PEA NUTS.

INQUIRER.—The information may be obtained from Messrs. Lever Bros., Sydney. The machine used for decorticating cotton seed would probably be able to do the same work on pea nuts.

HAND MACHINE FOR MAKING MAIZE FLOUR.

MEALIES, Woodsprint.—Apply to Smellie and Co., Brisbane, for particulars of the "Little Wonder," price £2 17s. 6d., or the "Emigrant," price £4; "Little Queenslander," price £1 5s., and other steel hand mills for grinding cereals into meal or flour, ranging in price from £1 12s. 6d. to £2 7s. 6d. These prices are merely approximate.

A PESTIFEROUS WEED *(Lobelia purpurascens).*

A. GAWTHERN, Yandina.—Mr. F. M. Bailey, Colonial Botanist, says the weed you send is not one which would become a pest in the field, but it is exceedingly poisonous and dangerous to stock. It prefers to grow under fences and along headlands. Keep the headlands clean, cultivate the land well, and spraying will not be needed. Spraying with a 2 per cent. solution of sulphate of copper, 98 per cent. pure, will probably destroy it, as would an 8 per cent. solution of iron sulphate. Use 40 gallons per acre. To 15 gallons of water in a tub add 3 lb. of copper sulphate or 12 lb. of iron sulphate. Put the sulphate in a bag, and keep stirring the water with the crystals. They will dissolve in about 15 minutes. Then add 15 gallons more of water and stir well.

BLIGHT ON ROSE-TREE.

ALTON DOWNS.—Wash with soapsuds to which a little kerosene is added. Rubbing with a clean rather stiff paint brush will also remove the scale, but will not kill it.

HOUSEHOLD REFRIGERATING MACHINE.

J. WEBB AND SON, Cooby Creek, Meringandan.—

As far as we are aware, no refrigerating machine suitable for household use has as yet been perfected, nor do we know of any work on the subject.

TO MAKE VINEGAR.

J. H. BANFF, Bellevue.—

To 8 gallons of clear rain water add 3 quarts of molasses. Turn the mixture into a clean, tight cask; shake it well two or three times, and add 3 spoonfuls of good yeast or 2 yeast cakes; place the cask in a warm spot, and in 10 or 15 days add a sheet of common wrapping paper, smeared with molasses and torn into narrow strips, and you will have good vinegar. The paper is necessary to form the "mother," or life of the vinegar.

The journal you mention is the *Agricultural Gazette* published in London. Subscription, including postage, 8s. 8d. per annum.

ESSENTIAL OILS—PASPALUM—MANURE FOR TOMATOES—SEA KALE.

W. Eustance, Mooloolah.—

1. Oil of Niaouli.—There is no eucalypt of this name; the Colonial Botanist cannot recognise it as such.

2. *Backhousia Citriodora.*—This does not belong to the Citrus family, but to the Myrtae, to which eucalypts belong. It grows in the scrubs. The leaf smells like the scented verbena grown in gardens.

3. The method of obtaining essential oils is given in the *Queensland Agricultural Journal*, Vol. II., pp. 144, 294. The crude oils do not require further distillation or any other treatment. Crude vegetable oils are the result of crushing, as in the case of olive, cotton, linseed, sesamé, &c.

4. It is better to plant paspalum roots than to sow seed. The roots may be planted out at any time during seasonable weather. Seed should be sown in September, 2 to 3 bushels per acre. Paspalum chokes other weeds.

5. The best artificial manure for tomatoes is made up as follows:—2 parts nitrate of soda, 2 parts bonemeal, 3 part kainit, and 4 parts superphosphate. Apply 1 oz. per square yard once a week from the time the plants are established until the fruit has set. Nitrate of soda will increase the yield from 35 to 60 per cent. when used in conjunction with phosphoric acid and potash. We published this recipe in September, 1901.

6. Sea kale requires great care in growing. It should do well in your district. Cultivation same as for rhubarb. Get two-year-old strong plants. Plant three in a clump 2 feet apart each way. When the young shoots are 8 inches high, cover them with large garden pots having the hole corked up. Draw earth round to keep out the light. Salt is a good special manure for sea kale.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JULY. Prices.
Apples, Eating, per packer	3s. to 7s.
Apples, Cooking, per case	4s. to 5s.
Apples, Tasmanian, Cooking, per case	...
Apples, American, Eating	...
Apples, American, Green	...
Lemons, Italian, per 360	...
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Lemons, New South Wales, per case	4s.
Oranges, Italian, per 180	...
Oranges, Local, per case	1s. 6d. to 3s. 6d.
Oranges, Sydney (packers)	...
Mandarins, Local, per case	1s. 6d. to 4s. 3d.
Mandarins, Bowen	...
Apricots, New South Wales, boxes (half-gincase)	...
Apricots, Queensland, half-case	...
Plums, half-gincase	...
Plums, Sydney, half-gincase	...
Peaches, half-gincase	...
Nectarines, half-gincase	...
Gooseberries, English	...
Cherries	...
Passion Fruit, quarter-case	2s.
Mangoes, per case	...
Pineapples, rough, per dozen	5d. to 1s.
Pineapples, Queen ,,	1s. to 2s. 6d.
Melons	...
Rockmelons	...
Bananas, per bunch	...
Bananas, per dozen	1d. to 1½d.
Tomatoes, quarter-case	1s. 6d. to 2s.
Papaw Apples, quarter-case	...
Custard Apples, quarter-case	...
Granadillas, case	...
Seville Oranges, apple-case	1s. 6d. to 2s.
Cape Gooseberries, quart	4d. to 4½d.
Pears (Melbourne), export case	...
Pears (Tasmanian), quarter-case	3s. to 3s. 6d.
Rosellas, per sugar-bag	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY.

Article.		JULY. Prices.
Bacon	lb.	5½d. to 8d.
Barley, Malting	bush.	1s. 10d. to 1s. 11d.
Bran	ton	£2 10s. to £2 15s.
Butter, Factory	lb.	8¾d.
Chaff, Mixed	ton	£2 10s. to £3

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY—*continued.*

Article.		JULY. Prices.
Chaff, Oaten	ton	£2 10s. to £3 12s. 6d.
Chaff, Lucerne	,,	£2 to £2 17s. 6d.
Chaff, Wheaten	,,	£2
Cheese	lb.	4d. to 5d.
Flour	ton	£7 5s. to £7 12s. 6d.
Hay, Oaten	,,	£4 17s. 6d. to £5
Hay, Lucerne	,,	£1 15s. to £2
Honey	lb.	1¾d. to 2d.
Maize	bush.	1s. 6d. to 2s.
Oats	,,	2s. to 3s. 8d.
Pollard	ton	£2 10s. to £3
Potatoes	,,	£2 to £3
Potatoes, Sweet	,,	£1 to £1 5s.
Pumpkins	,,	15s. to £1 1s. 8d.
Wheat, Milling	bush.	2s. 9½d. to 3s.
Wheat, Chick	,,	1s. 8d. to 2s. 6d.
Onions	ton	£3 5s. to £3 10s.
Hams	lb.	8½d. to 10d.
Eggs	doz.	8d. to 1s. 3½d.
Fowls	pair	1s. 10d. to 3s. 8d.
Geese	,,	4s. 6d. to 5s. 8d.
Ducks, English	,,	2s. 6d. to 3s. 6d.
Ducks, Muscovy	,,	2s. 9d. to 7s. 6d.
Turkeys, Hens	,,	5s. to 7s. 6d.
Turkeys, Gobblers	,,	9s. to 12s. 6d.

ENOGGERA SALES.

Animal.	JUNE. Prices.
Bullocks	£8 12s. 6d. to £10 2s. 6d.
Cows	£6 10s. to £7 12s. 6d.
Wethers, Merino	19s. 9d. to £1 3s.
Wethers, C.B.	£1 1s. to £1 5s.
Lambs	16s. 3d. to £1 1s.
Baconers	£1 14s. to £2 5s.
Porkers	£1 5s. to £1 7s. 6d.

Orchard Notes for August.

By ALBERT H. BENSON.

The planting of deciduous trees should be completed by the end of this month in all parts of the State, but evergreen trees can be transplanted during seasonable moist weather at any time of the year if the operation is carefully carried out. When set out, the young trees must be cut hard back to a height that in no case should exceed 2 feet from the ground, and in warm dry districts half of this height is to be preferred. Cutting back at planting insures a

strong and vigorous young growth, whereas by neglecting to cut hard back at planting the future growth, vigour, and symmetry of the tree are greatly impaired if not completely spoilt. The pruning of all deciduous trees must also have been completed; and all citrus fruit trees from which the fruits have or should have been gathered should be gone over carefully, all dead and badly diseased wood should be removed, and any crossing or superfluous branches, or water sprouts, should be cut away. When the trees are badly attacked by scales, this pruning should be severe, in order that the remedies used for dealing with these pests may have a fair chance, as when the top of a citrus tree is allowed to grow like a mat it is impossible to get the spraying material on to the parts where it is most wanted. Spraying should be systematically carried out in every orchard in the State during this and the preceding month, and in the case of fungus diseases on deciduous trees during the following month as well. Spraying is just as essential an operation as the gathering of the fruit; and no fruit-grower who wishes to make fruit-growing a success can afford to neglect it, as it is impossible to breed disease in fruit trees and to grow fruit profitably at one and the same time. A full description of the operation of spraying and of the most approved remedies was published some time ago in pamphlet form by the Department of Agriculture, so that any grower who has not received a copy and who desires to obtain the necessary information may obtain it by writing to the Department. After pruning and spraying, the orchard should be ploughed; so that all weeds and trash can be buried, and also that the land that has been trodden down firm shall be broken up. Use a short American plough that will take a wide furrow and turn it right over. The depth at which to plough will depend on the treatment the orchard has previously received and on the nature of the soil. If the soil is shallow, or if the land has never been worked, then the ploughing must be shallow or the roots will be badly injured; but where there is plenty of soil and a perfect subdrainage, then the ploughing can be from 4 to 6 inches in depth (provided the land has been previously cultivated) without any injury to the trees. In fact, in such soil surface roots are not required, and the trees stand dry weather best when deeply rooted.

Quick-acting artificial manures, such as sulphate of ammonia, sulphate of potash, or superphosphate, can be applied during the month, but care should be taken not to apply too large a quantity at once, as, owing to their extreme solubility, a considerable portion of them is apt to be washed out and lost by heavy rains. In conclusion, one more word about spraying, and that is: Do your utmost to stamp out diseases in new districts as soon as ever they make their appearance. Do not consider any disease too trivial, and that it can be well let alone to a more convenient time, as the more convenient time will not come; but the disease will flourish and spread rapidly, so that what might have been checked, if not eradicated, by half an hour's work will now take the grower all he knows to get the better of it. In spraying, whether for insects or fungi, a knowledge of the pest to be treated, combined with carefulness and promptitude, are the essentials of success.

In notes of this kind it is impossible that they can apply equally to every part of the State, but they will be found to be about an average. Very early districts will sometimes requires the notes of a month later, and very late districts those of a month earlier.

Farm and Garden Notes for September.

Field.—Spring time has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly cultivated land. Therefore, the cultivator, the hoe—horse or hand—must be kept vigorously at work to check the weed pests and save the growing crops and much future labour. Attend

to earthing up any crops which may require it. There may possibly occur drying winds and dry weather; still good showers may be looked for in October, and much useful work may be done during the present month which will afford a fair prospect of a return for labour. Plant out *Agave rigida, var. sisalana* (sisal hemp plant), in rows 8 feet apart each way on rich soil, or 7 feet by 7 feet on poor lands. All *dry* places on the farm too rocky or poor for ordinary crops should be planted with this valuable aloe. If the soil is very poor and the plants very small, it is better to put the small plants out in a nursery of good soil, about 2 feet apart. Next year they will be good-sized plants. Keep down tall weeds in the plantation, and do not allow couch grass to grow round the roots. The Agave will do no good if planted in low, wet land or on a purely sandy soil. It thrives best where there is plenty of lime, potash, and phosphoric acid, all of which can be cheaply supplied if wanting in the soil. Sow maize, sorghum, imphee, prairie grass, panicum, tobacco, and pumpkins. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, earth or pea nuts, arrowroot, turmeric, ginger, and canaigre (bulb yielding a valuable tanning substance). Plant out coffee.

Kitchen Garden.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing most kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost, dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and stir the soil in the latter case early next day to prevent caking. Mulching with straw or leaves or litter will be of great benefit as the season gets hotter. It is a good thing to apply a little salt to newly-dug beds. It is not exactly known what the action of salt is on the soil, but when it is applied as a top-dressing it tends to check rank growth. A little is excellent for cabbages, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 feet apart and 18 inches between the plants, and the climbing sorts 6 feet each way. Sow cucumbers, melons, marrows, and squashes at once. If they are troubled by the beetle, spray with Paris green or London purple. In the June issue of the *Journal* Mr. S. C. Voller gave an excellent recipe for a spray for vegetables. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 feet apart. Plant out tomatoes 3½ feet each way, and train them to a single stem either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinach, vegetable marrows, custard marrows, lettuce, parsnips, carrots, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory, provided the ground is well worked, kept clean, and that water, manure, and, where required, shade, are provided.

Flower Garden.—Continue to plant bulbs as directed last month. Protect the plants as much as possible from cold westerly winds, which may still occur, notwithstanding the increasing temperature. Keep a good lookout for slugs. Plant out chrysanthemums, palms, and all kinds of tropical and semi-tropical plants. If hot weather should ensue after planting, water and shade must be given. Sow dianthus, snapdragon, coleus. Roses will now be in full bloom. Keep them free from aphis, and cut off all spent blooms. This latter work should be done in the case of all flowers. If you wish to save seeds, do not wait for the very last blooms, but allow some of the very best to go to seed. If you have any toads in the garden or bush-house, be careful not to destroy them, but encourage them to take up their abode there. They are perfectly harmless in spite of their ugliness, and they destroy an astonishing number of insects injurious to plants. Fill up all vacancies with herbaceous plants. Sow zinnia, galliardia, amaranthus, cockscomb, balsam, sunflower, marigold, cosmos, summer chrysanthemum, coreopsis, portulacca, mesembryanthum, calendula, &c.

[*Frontispiece.*

Chayote or Choko Vine.

Agriculture.

THE DISTRICT EXHIBITS AT THE EXHIBITION.

As our readers will have been already made acquainted with almost every item of the exhibits through the medium of the daily and weekly metropolitan and country journals, we refrain from taking up our space with a repetition of what has already been made public; but, at the same time, we think that this *Journal* should record the results of the competition between the seven districts of Queensland and that of Glen Innes, whose exhibits were very varied, extensive, and, as a rule, admirably arranged.

In this friendly rivalry, the Moreton District again came to the front as winner of the first prize. The details, which we take from the *Brisbane Courier*, are as follow:—

1. Moreton—273 points.
2. Warwick—267 points.
3. Glen Innes—262 points.
4. Logan—241 points.
5. Rockhampton—234 points.
6. Maryborough—207 points.
7. Mackay—203 points.

The possible number of points was 500.

It will be seen that Warwick scored the highest points as far as the quality of the exhibits was concerned, leading Moreton by 3 points, but the latter gained 20 points for "effective arrangement" to 12 for Warwick, and so won by 5 points. The win of the Moreton District is the third in succession, and the committee who had charge of the exhibit are to be congratulated on the result of their arduous work.

The following is a list of the points gained for each item specified in the conditions of the competition:—

List of Points.

—	Moreton.	Warwick.	Glen Innes.	Logan.	Rockhampton.	Maryborough.	Mackay.
Dairy produce (50)	28	31	23	29	24	20	11
Foods (50)	36	16	9	32	22	13	6
Fruits and vegetables (50)	40	11	35	34	24	24	20
Grain, &c. (50)	15	36	40	13	20	20	9
Manufactures and trades (50)	26	34	21	25	24	30	17
Minerals and building materials (25)	13	17	15	9	18	14	14
Tropical Products (50)	17	3	3	17	14	9	44
Wines (25)	18	21	11	11	14	6	9
Tobacco (25)	0	16	10	1	0	10	0
Hay, chaff, &c. (50)	21	29	41	19	25	30	7
Wool (25)	20	23	23	16	14	6	6
Schools (25)	18	18	15	17	20	9	0
Effective arrangement (25)	20	12	16	18	15	16	10
Total (500)	272	267	262	241	234	207	153

DETAILS OF POINTS AWARDED.

Exhibits.	Max. Number of Points.	Moreton.	Rockhampton.	Logan.	Warwick.	Glen Innes.	Mackay.	Maryborough.
Butter	25	15	14	18	16	12	10	10
Milk in any form	10	3	3	5	3	3	0	3
Cheese	10	6	4	3	9	5	0	4
Eggs	5	4	3	3	3	3	1	3
Hams, bacon, rolled and smoked beef and mutton	10	7	1	9	6	3	2	5
Smallgoods and sausages	5	4	3	4	0	2	1	0
Canned meats	10	9	9	9	0	0	0	0
Fish, smoked, preserved, and canned ...	5	4	4	4	0	0	1	1
Fresh chilled beef, mutton, and pork, poultry, and game	10	3	0	0	5	0	0	0
Lard, tallow, and oils	5	5	0	3	2	0	0	3
Honey, &c., confectionery	5	4	5	3	3	4	2	4
Fresh, canned, and bottled fruit	10	9	3	7	4	7	5	4
Canned and bottled vegetables and roots, dried vegetables and roots	5	4	1	0	9	3	1	1
Jams and preserves	10	9	8	8	0	9	4	6
Prepared arrowroot, cassava products ...	5	4	0	3	2	2	2	2
Fresh vegetables, including table pumpkins	10	10	7	9	4	8	4	7
Chutney, tomato, mango, and other sauces	7	2	3	5	0	3	2	2
Cocoanuts and nuts	3	2	2	2	1	3	2	2
Wheat, flour, bran, pollard, macaroni, and meals prepared therefrom	20	5	10	0	19	19	3	8
Barley malt, pearl barley	10	0	0	3	8	6	0	3
Maizemeals, starch, and glucose, maizena, cornflours	10	7	3	4	4	8	3	5
Oats, rye, rice, and their meals	5	0	2	2	3	4	2	2
Biscuits, bread, and cakes made from any cereal	5	3	5	4	2	3	1	2
All woodwork	10	7	6	8	10	3	3	10
All metal and iron work	10	4	4	3	8	4	4	10
All tinwork	6	2	2	3	4	3	0	4
Leather, and all leather work and tanning	10	10	7	6	9	9	5	2
Manufactured woollen and cotton fibre ...	8	0	0	0	0	0	2	0
Artificial manures	3	3	2	2	0	0	1	2
Brooms and brushes	3	0	3	3	3	2	2	2
Coal, Iron, and other materials, and salt	12	3	12	3	6	11	8	8
Stone, bricks, cement, marble, terracotta	8	7	4	4	8	2	2	3
Woods, dressed and undressed	5	3	2	2	3	2	4	3
Sugarcane, sugar, raw and refined, and syrups	30	10	2	12	0	0	28	8
Coffee, raw and manufactured, tea, and spices	5	4	2	0	0	0	4	1
Cotton, raw, and by-products	15	3	10	5	3	3	12	0
Wines	15	12	8	5	12	5	5	5
Vinegar and cordials...	5	3	3	2	5	3	4	1
Aerated and mineral spa water	5	3	3	4	4	3	0	0
Tobacco, raw	15	0	0	1	10	10	0	10
Manufactured tobacco, plug and twist ...	5	0	0	0	4	0	0	0
Cigars, cigarettes, and snuff	5	0	0	0	2	0	0	0
Oaten, wheaten, lucerne, and other crops	15	8	6	7	9	14	0	9
Grasses and their seeds	5	2	2	3	4	5	2	2
Oaten, wheaten, lucerne, and other chaffs	15	8	10	7	9	14	0	11
Ensilage and other prepared cattle fodder and pumpkins	10	2	5	0	7	5	3	6
Sorghum and millets	5	1	2	2	0	3	2	2
Scoured wool	13	10	8	8	12	12	0	0
Greasy wool	12	10	6	8	11	11	6	6
Best essay on value of agriculture and dairying, to be judged for writing and composition	10	8	8	7	6	7	0	3
Needlework, knitting, fine arts	10	7	7	7	8	6	0	3
School work, maps, writing, &c.	5	3	5	3	4	2	0	3
For effective arrangement of exhibits ...	25	20	15	18	12	16	10	16

QUEENSLAND MALTING BARLEY IN ENGLAND.

We take from the *Mark Lane Express* the following satisfactory notice of the shipment of malting barley from Brisbane to London by the Aberdeen liner "Sophocles"; 2,000 bushels were sent as a trial shipment, and this is what the above journal says about it:—

An important development in the export trade of the State of Queensland is the inauguration of shipping malting barley to London. The s.s. "Sophocles," of the Aberdeen Line, recently brought 250 quarters as a trial shipment; of this quantity the Agent-General, Sir Horace Tozer, is having 100 quarters malted for test purposes, and samples of the grain have been sent to various representative maltsters throughout Great Britain for their expert opinion as to the quality of the barley for malting purposes, and to ascertain its market value, and how it compares with other kinds sent to this country.

Messrs. Gilstrap, Earp, and Co., Montgomery, Jones, and Co., L. and G. Meakin, Limited, and other firms, have tested this barley, and pronounced most favourably upon it. It appears that during the malting season about 37s. 6d. per 448 lb. might be the value, and the firms mentioned compare the grain with Hungarian barley, and they suggest that it should be shipped over in commercial quantity by sailing ship, to arrive about September or October.

One leading firm allude to the "golden skin and general quality" of this Queensland barley, and they place it in a high class, considering that it holds its own with any barley used during the past season. They state that it will always find an excellent market here in comparison with Montana-Chevalier, Chilian-Chevalier, and Californian, and, to come nearer home, Bohemian. The only barley which this house considers at all superior is English, grown in very favourable seasons, on our best lands.

Queensland agriculturists can point with pride to the following figures of the results of barley-growing in their State—the average yields per acre throughout the Australian continent being as follows:—Queensland, 23.5 bushels; Victoria, 21.4 bushels; New South Wales, 17.7 bushels; South Australia, 15.7 bushels; Western Australia, 13.2 bushels.

These figures are for 1901, and those for the decade 1892-1901 show an average yield of 19.1 bushels for Queensland, the State for that period being again far ahead of any other Australian State.

In 1903, the average return per acre of malting barley was 22.81 bushels.

YIELD OF A 100-ACRE DAIRY FARM.

A New Zealand dairy farmer, writing to a Taranaki paper, gives some very interesting particulars concerning the yield from his 100-acre farm, valued at £20 per acre. He says:—"We keep on 100 acres 40 cows, 1 bull, and 2 horses all told. The two horses do all the work in the way of taking milk to the factory; they do ploughing, cart potatoes to market, and in the future they will take the pigs to an up-to-date factory in Eltham. The return for our cows is £8 10s. for butter fat. We average 30 calves, and for the first draft of 20 we get £1 10s. each, for the remaining 10 £1 5s. each. With growing a few extra root crops, we can fatten 30 pigs at £2 each. This year has been an exceptional good season for potatoes—in fact, all root crops have turned out above par in quality as well as quantity, so that the average yield has been over 10 tons to the acre. Well, my 1½ acres gave me 14 tons of good commercial potatoes, of which I sold 10 tons at £1 12s. 6d. on the trucks. Poultry I will not mention, as they belong to my good wife, and the proceeds are part of her pocket money. The cultivation necessary for the 40 cows, pigs, and potatoes is about 16 acres. The labour is done by myself, my children, and a man at £1 5s. a week. If you reckon up my income and expenditure, you will find that I have something like £383 15s. to live on and pay my rates and taxes with. I may state if my sons were a few years older the £75 for wages would be retained in the family purse."

We esteem any farmer fortunate who enjoys such a comfortable living as is indicated by the above statement. How many farmers of 100 acres in Queensland can show a similar balance-sheet. The sugar-cane farmer certainly should be able to do so if he can produce from 15 to 20 tons of cane per acre annually. A dairy farm should return at least £2 per acre, a cotton farm £5 per acre net, but maize, potatoes, wheat, and vegetables alone will not produce anything like such an income.

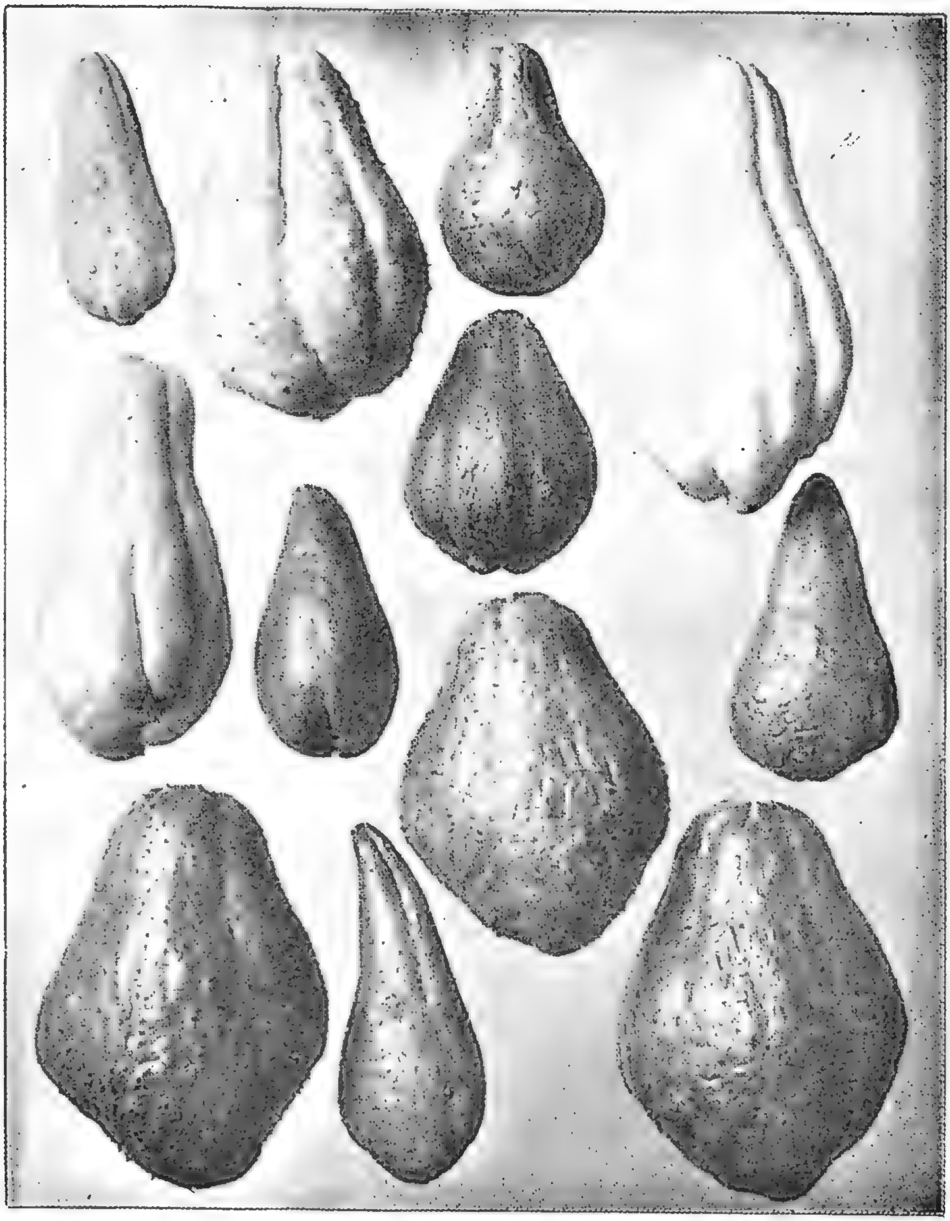
It will, no doubt, sound incredible to the farmer of the present day that over £400 a year could be made out of a 20-acre farm on the new scrub lands near Brisbane in the sixties. Then maize was worth from 4s. 6d. to 6s. per bushel; potatoes brought from £8 to £12 per ton; cabbages, by the dozen, 6d. each; green lucerne, 6d. per bundle; eggs, 2s. 6d. per dozen all the year round; fowls, 6s. per couple; arrowroot bulbs, £2 10s. to £3 per ton. All sorts of vegetables were saleable at similar high prices. The banks of the river and creeks were planted with bananas, which found a ready market at 4d. per dozen wholesale. There were numbers of what might be termed market gardeners, both above and below the city on the river, who made a comfortable living on 5 acres of good scrub land. A man who farmed 50 acres in those days was a well-to-do man, better off than many a 500-acre farmer of to-day. The yield of potatoes on these farms rarely exceeded 4 tons per acre, but 60 bushels to 80 bushels of maize were usually obtained, both from the early and late crops. Potatoes were planted, as they now are, twice a year. Few farmers kept cows, but all had a few pigs, which practically cost nothing to keep, but were always worth money either alive or as pork, bacon, and hams. Wages were not high. At one time, farm labourers got £1 per week and rations, but, as immigrants poured in to the colony, first-class men were obtained for £40 per annum and rations. We leave it to our readers now to calculate what the income of the 20-acre farmer of 1863, say, would amount to. It was rare that more than two wages men were employed. Some farmers only engaged men for corn-pulling or potato-digging, but where all transport was by boat one man at least had to be regularly employed, as the heavily laden market boats were taken down or up the river twice or three times a week, carrying grain, potatoes, vegetables, fowls, eggs, bananas, &c., to market, and returning with stores, &c.

NEW POTATO DIGGER.

The production of a perfect potato digger has for years been the dream of inventors of agricultural machinery, and many have claimed perfection for their machines. Now we have another, which has been patented throughout the world by a New Zealand firm. It is called the "Andrews and Beaven." A trial of this machine was made (says the *Canterbury Times*) at a farm at Yaldhurst, under very adverse circumstances. During the afternoon heavy rain fell, causing the earth to adhere to the driving wheels in such a manner as to prevent them from gripping the ground as they would have done under ordinary conditions, but, notwithstanding this, the machine worked well, and gave entire satisfaction to those who witnessed the trial. The crop of potatoes was an average one, yielding about 5 tons per acre, the potatoes being of medium size, with a fairly large proportion of small ones. A noticeable feature of the machine was the manner in which it cleared itself of tops, grass, and other obstructions. The machine weighs about 7 cwt., and is of light draught. At the trial four horses were used, but two should be able to draw it without difficulty, and it is capable of digging from 3 to 4 acres per day of eight hours irrespective of the yield.

The construction is very simple, consisting of a suitable framework, substantially built, and is carried on four wheels, the front two steering wheels controlled by a lever from the driver's seat. Attached to the frame are two beams carrying a share, capable of being raised or lowered to suit the depth of

Plate VI.



Some Varieties of the Choko Fruit.

the potatoes. This is done by means of a lever placed within easy reach of the driver. The rear end of the share has a downward projecting flange, pierced by a number of holes, in which slide a number of thin bars, forming a grid. The back ends of these grid bars finish in an eye, through which is a bar attached to two side levers, which are driven by means of cranks, rotated by gearing from the driving wheels. The earth and potatoes, passing over the share, pass on to the grid, along which they travel by the motion of the machine. The earth falls through the grid, and the potatoes, both large and small, are dropped over the back of the grid and left on the surface of the ground. At the trial the potatoes were left absolutely uninjured, and no potatoes, either small or large, were left in the ground. The uninjured condition of the potatoes was primarily due to the fact that the sorting action of the machine is gentle and continuous. One noticeable feature is that the share is placed midway between the driving wheels, and as these are plated it is impossible for any earth or potatoes to pass over the side of the share. It is believed that this is the only machine of the kind in which the mechanism for raising the potatoes is placed immediately between the driving wheels. The machine has been extensively patented throughout the world, and will be placed on the market at a moderate price.

THE CHAYOTE.

Under this name few Queenslanders would recognise the familiar "Choko." This vegetable has twenty-eight different names, all corruptions of the Mexican word "Chayote." The nearest to the Australian nomenclature is that of the West Indies, where it is called the "Chocho." In Porto Rico it is always called "Tayote." However, be the name what it may be, we are only concerned with the vegetable itself. Although introduced many years ago into Queensland, it was not recognised by the general public as an excellent table vegetable until within the last two or three years. Now it has undoubtedly taken its place amongst table vegetables, when cooked in the same manner as custard marrows and cucumbers. The chayote is a climbing vine, producing an immense quantity of light-green foliage, and is of very vigorous growth. It is one of the most prolific bearers amongst the Cucurbitaceæ, from which family it differs in that it has only one seed. It is very easily propagated by planting the whole fruit. When the seed has germinated, a plumule or sprout emerges between the cotyledons, and this sprout will continue green for a very long period even when lying unburied. Chokos may be seen in the seedsmen's and fruiterers' shops in Brisbane with this green sprout well developed. The plant thrives in a remarkable degree on our rich scrub soils, notably on the Blackall Range, where the fruit is grown in large quantities for feeding dairy cattle, pigs, and horses. At Mapleton, on the Range, the chokos are pitted. In these pits, or rather hills, they sprout very soon, and remain perfectly fresh and good for a long time. A prodigious number of fruits are gathered from a single vine, as many as 400 having been gathered in the season. No disease of any kind has been known to attack the plant in Queensland, its exceptional vitality rendering the fruits immune to the attacks of insects and fungi. In contrast with most other fruits or vegetables, the choko will stand knocking about and bruising without injury to its keeping qualities. As already stated, the choko is now much used as an article of food in this State. The only way in which it is prepared for table is by cutting the fruit in half, boiling it, and serving with the addition of pepper, salt, and melted butter.

The United States Department of Agriculture has issued a Bulletin (No. 28) on "The Chayote, a Tropical Vegetable," by O. F. Cook, Special Agent for Tropical Agriculture, which deals exhaustively with the history of the plant, and conveys much interesting information concerning it. From this bulletin we have taken our illustration of the chayote, or, as we call it in Queensland, the choko.

Dairying.

CAUSES OF VARIATION IN THE BUTTER-FAT PERCENTAGES AND WEIGHT OF MILK AND CREAM.

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As this very important subject has been freely discussed of late, and various opinions expressed, it will be to the gain of suppliers and butter-makers alike to have an explanation given of the various causes that influence the yield and quality of milk and cream.

THE COW.

Let us, first of all, consider the cow and her milk. Animals in good health and those that are well fed and well treated will give an almost equal quantity and quality of milk per day. On the other hand, when they are either unhealthy, or irregularly fed, and the quantity and quality of food insufficient to meet the requirements of the animal's body, the milk yield and butter-fat percentage will fluctuate morning and afternoon. Again, the hours of milking, number of times milked, weather conditions, and efficiency of milkers will influence considerably the morning and afternoon quantity and richness of the yield. Let us discuss the hours of milking, and see what results have already proven. In extensive experiments on the feeding of dairy stock conducted by the writer some years ago, cows were milked at the following hours:—

Lot 1.—3.45 a.m. and 3.45 p.m.
Lot 2.—7 a.m. and 5 p.m.
Lot 3.—5.30 a.m. and 12.30 p.m.

Selecting one cow in each lot, two of which were advanced in calf, their average daily milk yield and butter-fat percentage for one week of the test were as follows:—

—	Quantity of Milk.		Quality of Milk.	
	Morning.	Afternoon.	Morning.	Afternoon.
	Lb.	Lb.	Per cent. Fat.	Per cent. Fat.
No. 1	16	16	5.2	5.2
No. 2	5¼	5	3.9	4.6
No. 3	8½	6	3.9	5.0

These extracts furnish evidence that the fluctuations principally occurred as a result of the hours of milking being unevenly balanced. What then must the daily difference be when there is a general disregard of attention to equally important factors? Take, for example, the rough treatment of cows either immediately before or during the operation of milking. Experience has shown to everyone that losses in quantity and quality of milk are sustained with nervous cows, and the ruinous yet common practice of exciting animals is recognised to have an almost immediate effect on the milk flow by arresting the action of the mammary glands in the udder at a time when their activity is desired.

So very injurious are these errors in dairying that in some instances the results would seem incredible. Take this illustration as an example: Two cows were milked at 5 a.m. and 5 p.m., morning and afternoon; the following morning both were milked at the same hours, but, contrary to rules, the animals

were hunted into their milking bails and otherwise roughly handled. The effect of the evil practice will be shown in the accompanying table:—

—	Before Rough Usage—Quantity of Milk.		After Rough Usage—Quantity of Milk.	
	Morning.	Afternoon.	Morning.	Afternoon.
	Lb.	Lb.	Lb.	Lb.
No. 1	12½	11½	6	10
No. 2	9	9	5	8
	Per cent. of Fat.		Per cent. of Fat.	
No. 1	3.9	4.0	3.2	3.7
No. 2	4.1	4.2	3.1	3.8

Neglect to strip cows thoroughly will also reduce the butter-fat returns by a large percentage, and this is more clearly recognised when we consider the richness of the strippings, which is often over 10 per cent. compared to the first-drawn milk, containing perhaps from 1.5 to 2.5 per cent. of fat.

Again, exposure to cold nights will quickly lower the flow and fat reading, although it may soon regain its former quantity and quality if the duration of cold is short and not too severe (proved by experiment). To obviate risks of this kind, I would strongly recommend shelter-sheds or rugging dairy stock.

Further, the milk from newly calved cows will show a marked difference in percentage composition compared with normal milk, and quantity of water consumed by animals, especially in hot weather, will have an almost immediate effect on the constituents. There are other conditions at work that need not be mentioned, all of which possess an influence on the formation of milk in the udder of the cow and supply given.

On the above part of our subject, and before concluding, let me give a list of features bearing on the milk yield of a cow and its quality which ought to be studied by every owner of milking stock.

For convenience, all headings will be termed "rules" throughout this paper—

1. Breed, individuality, and period of lactation.
2. Feeding and changing of rations.
3. Hours of milking and times milked.
4. Kind treatment.
5. Efficient stripping.
6. Protection against exposure.
7. Abundant supply of drinking water in hot weather, which should be within easy access to milking stock.
8. Health of cows and freshly calved animals.
9. Calf allowed to remain with its mother.

Comment might be made on No. 9, as the rule in some districts is to milk only once a day, while the calf accompanies its mother at all times. Apart from the very hurtful influence such a practice has upon the good qualities of the cow, the yield of milk and percentage of butter fat are never alike from day to day. What, then, happens to the cream supply? The answer is, variation in the butter returns.

What will be learned from the above shows clearly that shrinkage in the yield of milk will influence the weight of cream, and a fall in the fat percentage will also interfere with the butter ratio of the cream supply. When all things are in favour of the cow, she will give her maximum quantity of milk, producing perhaps 1 lb. of butter from 24 lb. of milk. A cold change sets in, or the animals are disturbed in some manner as already described, and what happens? Down goes the weight of milk and butter-fat percentage, and, instead of 24 lb. producing 1 lb. of butter, 28 lb. are required. There are other factors influencing the weight of cream, and more particularly the proportion of fat in it, the most troublesome and responsible of which is the hand separator.

THE SEPARATOR.

To accomplish separation in a satisfactory manner, attention must be devoted to the physical condition of the milk and to important requirements of the machine. So momentous are these, that a full explanation of each is necessary; but, before discussing them, I will enumerate the chief points in separation worthy of our most careful and serious consideration. Permit the numbers given to be a continuation of the rules already written, and which will be extended to the conclusion of the article—

10. Solidity of foundation and working efficiency of separator.
11. Physical condition of milk and temperature.
12. Speed of separator and inflow of milk.
13. Practice of separation.
14. The uses of water and skim milk before and at conclusion of separation.
15. Alteration of cream screw.
16. Thickness of cream skimmed.
17. Warming bowl before separation.
18. Cleaning the separator.
19. Adding colostrum or new milk to the supply.
20. Addition of preservatives to milk.

Rule 10 directs attention to a weakness that is not of uncommon occurrence, and where it exists uniformity in skimming will not be attained. Further, we find that parts of the separator are out of gear, and under such a condition, with work of so delicate a nature, variations in the cream returns must necessarily result.

Rule 11.—It is universally recommended to separate immediately after milking, and why this should be so persistently advocated is for the following reasons:—

(*a*) The milk has a very fluid condition.
(*b*) It is free from acidity.
(*c*) It is not dense.
(*d*) The fat globules are not dangerously grouped.
(*e*) The adhering power of casein and other substances to the fat globules is decreased.

In cold milk we have conditions opposite to the above, which at once explains the inability of the separator to accomplish clean skimming. We also observe that, when cold and warm milk are mixed together, there is a loss in cream; but this practice is met with more frequently in the colder temperatures of winter. In the summer time, when milk is kept over-night and separated on the following morning, there is a loss of fat in the cream owing to a degree of acidity or sourness having developed, causing an increase in the density and viscosity of the milk. For this reason it is preferable to separate old milk by itself at a time and season when the weather is unfavourable to a high degree of fermentation. We also suffer losses in our cream returns when milk is carted long distances before being passed through the separator, and jolting in carts and exposure of milk cans to high temperatures cause a condition in the milk that taxes the efficiency of separation to its utmost, and may result in the escape of a considerable percentage of cream and butter fat in the separator milk.

Rule 12.—The speed of the bowl should not be less than the number of revolutions recommended by the manufacturers, otherwise a falling off in the power will reduce the skimming qualities of the separator. The inflow of milk must not exceed the quantity the bowl is capable of treating, otherwise excess of butter fat will pass away in the skim milk. The embodiment of Rule 12 is, no doubt, to a large extent, the cause of much heartburning and discontent at our creameries, factories, and dairy farms. Irregularity in the turning of the separator handle will soon manifest itself in variation in the butter-fat tests of the cream. Young people are entrusted with this important duty, and, without

knowing the gravity of the work, do not drive the separator at a steady speed, whereupon the inflow of milk is not sufficiently exposed to centrifugal force to effect a proper separation of the cream.

Rule 13.—In separating, the operator should be particular to keep a continual flow of milk passing into the bowl, and not stop or slacken speed because the receiver is empty. Arrangements should be carried out so that the receiver is never permitted to exhaust itself, and this will reduce the possibilities of loss.

Rule 14.—When water or skim milk are run into the machine before and at the close of working, the percentage of butter fat in the cream will not suffer, as believed. Care should be devoted, however, to the addition of regular quantities of skim milk, which is preferable to water to remove the cream adhering to the plates or inside parts of the bowl when separation is finished.

Rule 15.—As every owner and those engaged in the working of separators know that altering the screw or regulator causes a variation in the thickness of the cream, it should not be practised except when there is a just and reasonable cause given.

Rule 16.—The best results are obtained from cream containing from 35 to 45 per cent. of fat; beyond 45 per cent. losses in butter-making are more likely to increase.

Rule 17.—To prevent cream from adhering to the discs of the machine and other parts of the bowl and escaping in the skim milk, it is recommended to run a small quantity of warm water through the separator before the addition of the milk.

Rule 18.—Separators must be thoroughly cleansed of the bad-smelling slime immediately after working, and not allowed to remain in abeyance until a "convenient" time during the day or shortly before use again. Disregard to wash and scald the bowl and its parts morning and afternoon when separation is conducted after each milking, under the belief that once a day is sufficient, will occasion heavy losses of cream, and the development of hurtful flavours will immediately begin in the product. Let not neglect to cleanse the separator be a charge against the dairyman, and never a source of evil in the manufacture of choice-flavoured butter.

Rule 19.—When quantities of colostrum are separated, slime soon accumulates in the bowl, and retards efficiency of the working parts of the separator. "New milk," as most people are aware, contains a high percentage of solid matter, having a sticky consistency, and possessing an offensive smell when left exposed to the air for an hour or two in warm weather. It is, therefore, reasonable to expect that grave dangers to the quality and keeping properties of cream arise from want of care in this direction.

Rule 20.—When milk is preserved and kept for hours, and then separated in a slightly acid condition, although not perceptible to ordinary observation, good results are not obtained.

Important Factors in the Separation of Milk.

In writing this summary, I will take the liberty to repeat rules already given, and add to their number, as it cannot be too much impressed upon all cream-suppliers the value of attending closely to this branch of the dairyman's work—

(*a*) Separate the milk as it comes from the cow.
(*b*) When this is inconvenient in cool weather, heat up to 90° Fahr. immediately before separating.
(*c*) Do not separate colostrum or beastings, neither the milk from diseased animals, or when calving is near.
(*d*) Do not mix cold and hot milk together, nor acid and sweet supplies.
(*e*) Milk that is a few hours old in hot summer weather should be separated alone and unheated.
(*f*) Have your separator firmly fixed, and all parts in thorough working order.

(*g*) Run a little warm water through the machine before commencing to separate.
(*h*) Regulate the inflow of milk.
(*i*) Keep the receiver well filled throughout the whole period of working.
(*j*) Do not alter the cream screw, excepting when absolutely necessary; skim an equal percentage of fat daily.
(*k*) Be careful and not use too much skim milk to wash the cream out of the bowl when the separator is in motion.
(*l*) Take the machine to pieces and thoroughly clean the inside parts at the close of each separation, and expose fully to the air.
(*m*) Put the separator together immediately before use.
(*n*) Be very careful to work at a sharp and steady speed.
(*o*) Do not add preservatives to milk to keep it sweet for separation.

It will thus be observed that variations in the weight of cream and percentage of fat may reasonably be attributed to the separator, as the slightest derangement of the mechanism, the result of clogging with new milk (colostrum) or general carelessness, lowers the efficiency of the machine as a clean and profitable skimmer. The condition of the milk, principally its temperature and freedom from acidity, requires the strict attention of every farmer to avoid a fall in the butter ratio of cream.

OTHER VERY IMPORTANT CAUSES—CREAM.

We now arrive at a stage that should command the thought of all cream-suppliers, and that is the age and mixing of cream and conveyance of same to factories. In this department of work we attribute a heavy waste in butter fat, and it is to be regretted that many lose sight of the agencies that are acting injuriously against the butter yield of farmers' cream. Let the remaining portion of this paper be intelligently studied until a clear understanding is made of each factor explained, and when this is done the veil will be removed from the eyes of a few suppliers who have been labouring under a misconception of the truth surrounding the "mystery" of the variability in the butter return of cream. I will refrain from entering into the charges that have been made against butter manufacturers, as I sympathise with the farmers and manufacturers alike, on the grounds that there are circumstances and conditions existing which are unfavourable to both parties concerned.

AGE OF CREAM.

The ripeness or degree of acid is a responsible element in the butter ratio of cream. If the percentage or quantity of acid is high, churning will be quick, and the risks of fat escaping in the butter milk greater, compared with cream that contains an average proportion of acid. Proof of this will be found in the table to follow, which illustrates twelve successive tests made at a South Australian factory in connection with experiments conducted by the writer.

—	Percentage of Acid in Cream at Churning.	Percentage of Fat in Butter Milk.	Temperature of Cream at Churning.
			Degrees, Fahr.
High	0.89	0.4	56
	0.80	0.4	57
	0.88	0.6	58
	0.90	0.6	59
	0.84	0.5	57
	0.84	0.6	58
	0.63	0.3	55
Good Average ...	0.56	0.2	56
	0.57	0.2	56
	0.57	0.2	56
	0.57	0.2	56
	0.55	0.2	56
	0.55	0.3	55

Best results usually follow a lower percentage than 0.55.

From these figures it will be gathered that the losses in fat increased when the acid exceeded 0.57 per cent., and this is more pronounced when the temperature of the cream at churning is high. In other experiments it was found that cream with 0.85 per cent. and 0.90 per cent. of acid did not lose much of its fat when the churning temperature was kept as low as 50 degrees Fahr. in warm weather. The above illustration, however, was not taken from suppliers' quantities of cream, but from cream separated in the factory, otherwise the fat losses would have been heavier, caused by want of uniformity in ripening and greater age, which are conditions usually found in the farm-separated product. It must be accepted by farmers that age of cream seriously affects the butter returns, and what must the waste be in some cases where cans of cream are sent many miles by road and rail and exposed to scorching weather for hours? The bacteriological and chemical changes that are produced, and which need not be explained here, work disaster in the body of the product to an extent that refrigeration fails to save the costly fat from passing away in the butter milk.

It is reasonable to expect that before very acid cream arrives at the depôt or factory a proportion of its fat will be churned into minute grains of butter, the result of jolting and vibration during transit by road or rail. It must, therefore, be admitted that throughout the hot summer weather the fat readings cannot be the same day after day when the consistency and acidity of the cream vary so much. Under these conditions the operators of the Babcock tester are compelled to deal with a supply of sweet and fresh cream one time, next it is partly curdled; chemical and bacteriological influences have been at work, and unsatisfactory fat percentages follow. Paying by results will never be free from adverse criticism and objection until cream is sent to our factories more frequently by those unable to consign it twice or thrice a week in a fit state for accurate testing and profitable butter-making.

Mixed Cream and Butter-making.

Let us add to this article a chapter on the above subject, as it has a relative importance on the question under consideration.

Sweet and acid supplies that have been mixed together shortly before churning will lower the butter ratio, as the ripe cream will yield its globules of fat to be changed into butter sooner than the sweet cream. Let us take one example, where the period of ripening occupied fourteen hours and the time of churning thirty-three minutes. The few hours given to ripening and a cool cellar selected for the cream (as it was in this case) would naturally lead one to expect that its condition at the time of churning would show a low acidity. This was the case, as determined by practical and scientific examination. From the knowledge that when sweet cream is churned at a high speed and temperature a loss of butter fat follows, and in the instance given we may attribute the deficit to this cause, as the proportion of fat found in the butter milk reached the unusual figure of 1.4 per cent. Now, assuming that this cream had been mixed with an acid quantity six or eight hours before churning, what would have been the gain? Churning would have taken less than thirty-three minutes, and the cream would have given up its fat in a way profitable to the factory.

Farmers Checking Factory Returns.

In order to obtain equal results from two given quantities of cream, the following conditions must practically correspond at the time of churning:—

(*a*) Consistency of cream.
(*b*) Percentage of fat.
(*c*) Ripeness or degree of acidity.
(*d*) Temperatures at churning.
(*e*) Kind of churn.
(*f*) Quantity churned.

(*g*) Speed of churn.
(*h*) Washing butter.
(*i*) Working butter.
(*j*) Salting butter.

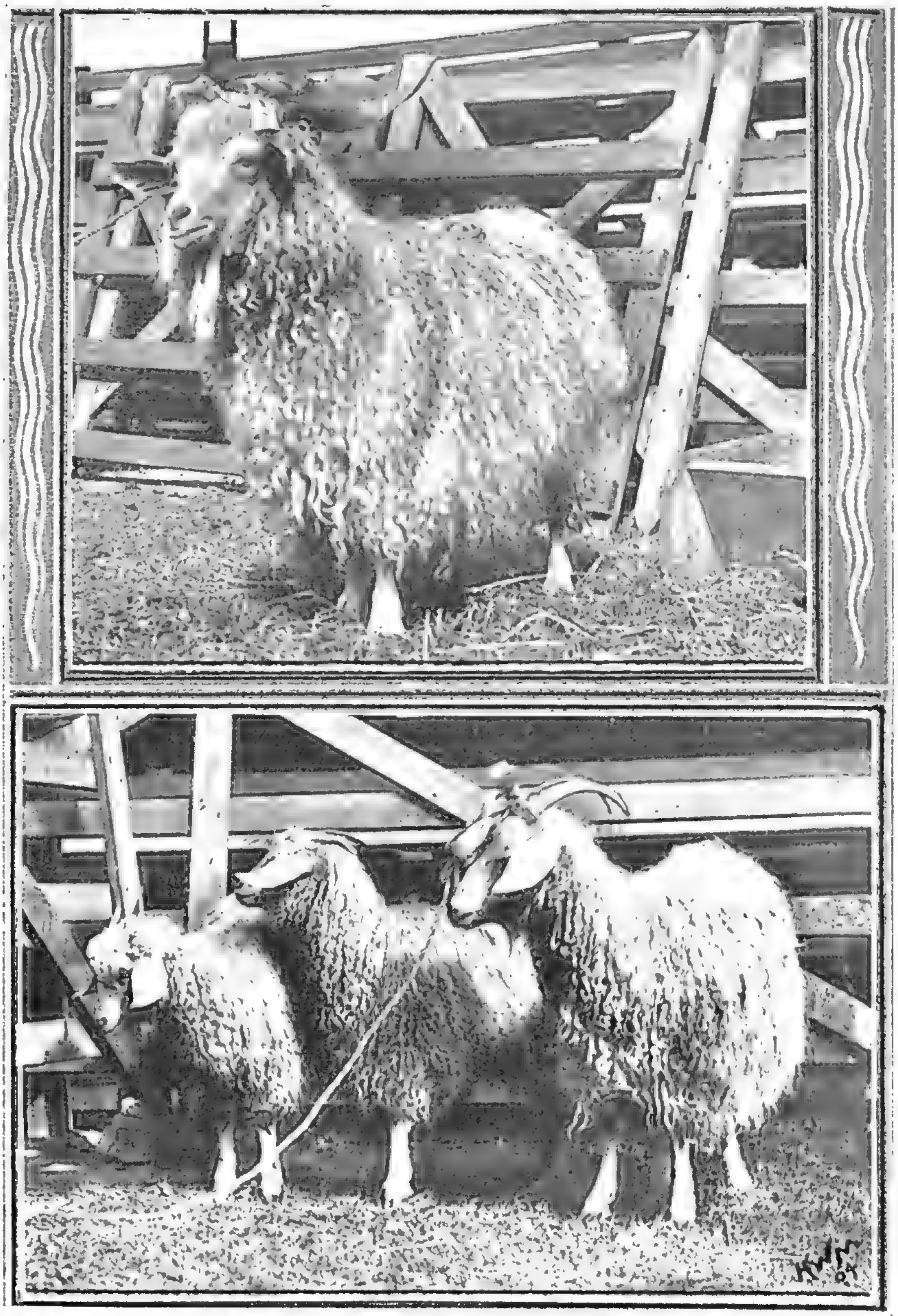
(*a*) If the consistency differs, there will be a variation in the fat percentage of the butter milk, as thick cream under ordinary circumstances churns quickly, and the difference in the time will influence the yield of butter obtained. (*b*) When supplies of cream of equal weight or capacity vary in proportion of fat, and both contain the same percentage of acid, and are treated in exactly the same manner, there will certainly be more butter got from one lot than the other. (*c*) Ripeness and temperature have already been explained. (*e*, *f*, *g*) Difference in make of churn and care in handling alter the butter ratio of cream. One churn might be too large or too small, and the concussion which accounts for the breaking of the cream into butter grains will accordingly vary; also the quantity churned, and the regularity in speed of churn will influence the freedom of the butter milk from high fat percentage. (*h* and *i*) Overwashed or underwashed butter will raise or lower the weight of the finished product. A poorly washed and a half-worked quantity will increase the weight, while that which is freed from butter milk, thoroughly drained in the churn and the water well worked out, will produce less butter. (*j*) When butter grains are heavily brined in the churn, or a large percentage of dry salt added on the worker, an increased quantity of water is left in the commercial butter, thereby adding to its weight. Further, it was proven by the writer during an investigation into the water-percentage of butter that the following conditions had some influences on the yield of the product—viz., drainage of butter in churn, temperature of washing water, temperature of cream, and season of year. In continuation of the rules of guidance already given in the first portion of the article, the following will complete the number:—

21. Cream must be equally ripened.
22. Cream must not be too thick or too thin.
23. Cream must not be heated or damaged in transit or otherwise.
24. Cream must not be sent in unfilled cans.
25. Cream must not be injured with preservatives.
26. Cream must be churned in a suitable churn.
27. Cream must be churned at a suitable temperature.
28. Butter must be carefully washed in the churn, and also worked with great caution, as the texture of the Queensland article is soft and delicate.

What do we glean from the eight preceding rules? That the farmers are suffering from butter-fat deficits in the churning of mixed cream. Contention between farmer and manufacturer is ever occurring, and we hear of a farmer in a district keeping back half of his cream supply and treating it at home. Comparing results with the factory, the dairyman is invariably pounds to the good. But that is no test whatever, being a most unreliable comparison, which I venture to say has been explained in this paper. Before similar results can be obtained in the treatment of a most delicate substance like cream, let me once again repeat that conditions must be the same from first to last. Exposure to heat and jolting on a rough road for a few miles will reduce the butter ratio of a can of acid cream by pounds.

In further consideration of the last table of directions, I might further emphasise and explain the dangers which accompany the transit of consignments of cream in partly-filled cans. When this is done, and the product has to suffer shaking during long journeys, partial churning of the fat quickly follows. This change is more marked in high temperatures, and, as readers have experienced, is very common in the summer months; while in the cold weather the opposite is noticeable, and difficulty is sometimes found in getting the fat globules to unite, the cream showing a "sleepy" condition. Such may also take place in hot weather, however, when preservatives have been indiscriminately used, as the

Plate VII.



ANGORA GOATS AT BOWEN PARK.

1. Pure-bred Buck Wellington.
2. Three-quarter-bred Doe and Kids.

EXHIBITED BY H. MISSING, ESQ., TALLEGALLA, TIARO.

natural ripeness in cream is arrested, and the escape of fat in some cases must be unusually high, while, in addition, the butter suffers in flavour. Unfortunately, the application of preservatives by cream-suppliers is becoming very common, and there is much need for warning before serious damage is done to the butter industry. Again, the butter-fat reading of cream is a sufferer.

In concluding this paper, I hope all interested in dairying will study each chapter of the subject carefully, and do all in their power to minimise the waste that retards the progress of the industry. Factories should receive the support of their districts, as the less handling that cream receives the better for its butter ratio and the quality of the product manufactured.

It cannot be too widely known that the use of the most modern improvements in the equipment of our dairy factories—not the least important of which is refrigerating machinery and cool chambers—enhances the money value of butter, and saves serious losses in the aggregate returns from the dairy herd.

When time permits, I intend to carry out a thorough practical and scientific investigation into the butter-fat testing of cream of different density, acidity, age, preserved and unpreserved, shaken and unshaken, and under varying conditions likely to affect the character and percentage of the fat and yield of butter.

QUEENSLAND MOHAIR.

Mr. H. Missing, of Tallegalla, Tiaro, who is largely interested in the breeding of Angora goats and the production of mohair, lately sent a small consignment of mohair clipped from half and three-quarter bred animals to England. The prices obtained averaged 8d. per lb., some fetching 10¼d. per lb. Mr. Missing expressed himself as quite satisfied with these prices. He sent a buck and two does to the Exhibition, where they were much admired. These animals, which are included amongst the admirable set of photographs taken by Mr. W. H. Mobsby, artist to the Department of Agriculture, took first prizes at the late Maryborough show. We reproduce the photograph in this issue.

ANGORA GOATS AT THE EXHIBITION.

The Angora goats here illustrated are the property of Mr. H. Missing, of Tallegalla, near Tiaro, who has a considerable number of these valuable animals. The buck, "Wellington," is about 2½ years old, and the doe is a young three-quarter bred animal, mother of the two kids with her. Mr. Missing lately sent home some mohair from half and three-quarter bred goats, and, although the quantity was small, and hence more difficult of sale than a large consignment, he received a price which he considered very satisfactory for the class of mohair—7½d. to 10d. per lb., or a average of about 8½d.

ANGORA MUTTON IN AMERICA.

Station, Farm, and Dairy, quoting George F. Thomson, of the Bureau of Animal Industry, says a considerable number but not many thousands of cross-bred Angora find their way to stock centres, such as Chicago, Kansas City, Omaha, Buffalo, and New York, and are there sold to the packing-houses if in good condition. They are purchased at a price slightly under that paid for sheep, and are disposed of in the carcass and sometimes in canned form as sheep mutton. These goats are usually some that have served a good purpose in clearing up brushwood, and, becoming fat on it, are worth more as slaughter animals than to sell to some other person for brush clearing.

The greater number of persons who are engaged in the Angora goat industry at this time—and the number of such will continue to increase—have a much better quality of goats than those that find their way to the market in

considerable numbers. They have animals that will yield a fleece worth from 4s. to 6s. each, and their value as destroyers of brushwood and weeds and as fertilisers of the land must be added; besides, the does raise kids that are worth 12s. each. The wethers produce a better fleece than the bucks for growing fleeces from seven to nine years. Only undesirable animals for breeding are sold for mutton.

A WARNING TO BREEDERS OF ANGORA GOATS.

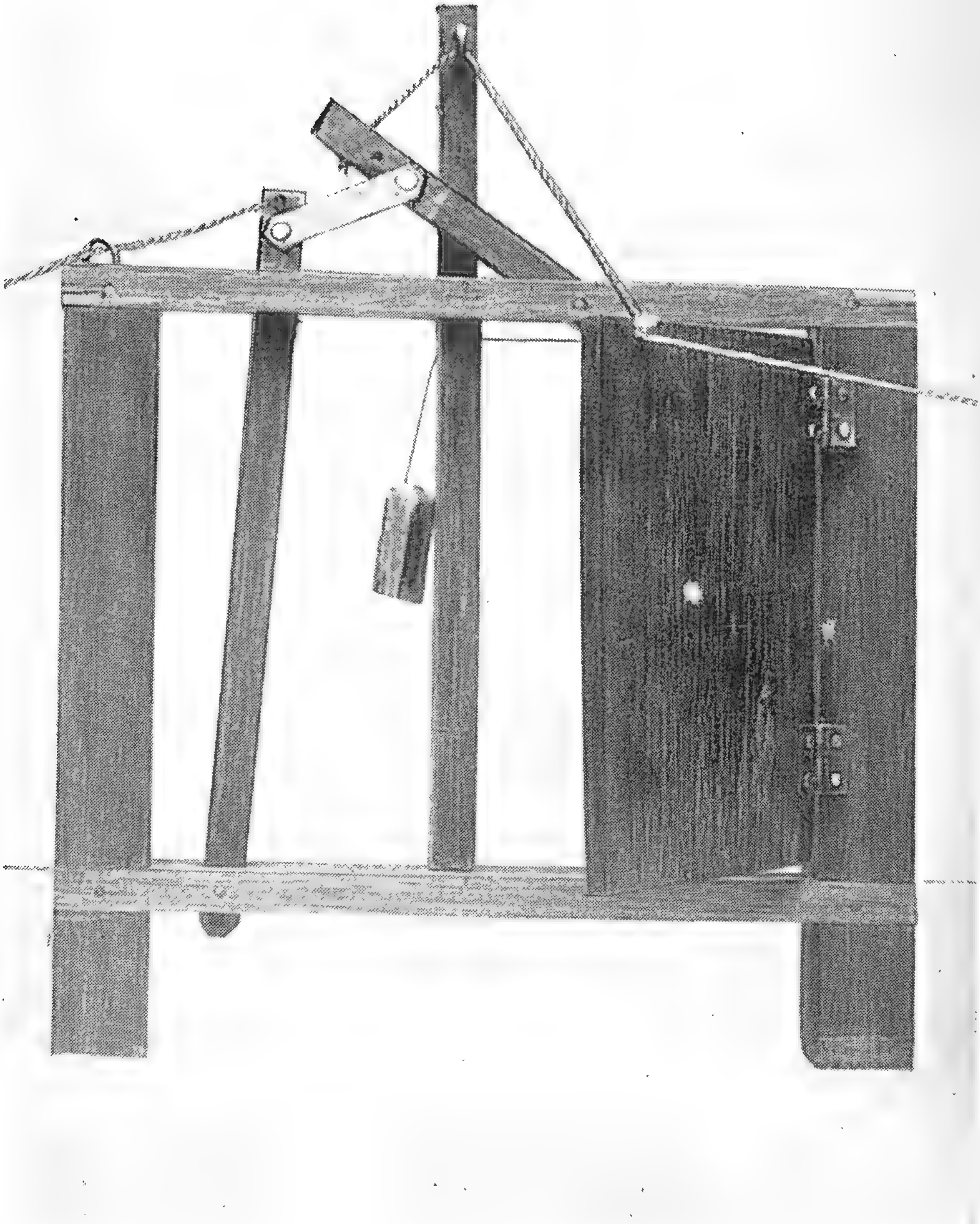
A writer in the *American Sheepbreeder*, who has considerable knowledge of the mohair industry, strikes a note which should be attentively considered by all who have already entered upon the business of breeding Angoras, or who have the intention of making a beginning. Of course, the main object of breeding these goats is the production of mohair. Now, although almost any quality of mohair has of late years found a good market, it should be remembered that the requirements of manufacturers of textiles are very liable to change—in fact, they always do change with the fashions in dress. We, therefore, commend to our readers' notice the warning of the American expert. He writes:—"Nothing has struck me more forcibly during the past few months than the universal interest being manifested in regard to mohair, and, being privileged to be in close touch with the United States, Australia, and South Africa, I can see on every hand very practical evidences of the quick movements which stockmen are making in their attitude toward the Angora goat. It is not for me to say how far present circumstances warrant pastoralists embarking on such a big venture as breeding the Angora and growing mohair. The wisdom or otherwise of such a proceeding rests entirely with the individual farmer, his land and the prospect of being able to tap a good market for his fleeces being the two most important items to be considered. However, it is just as well if I point out one or two little items which are of first importance to either a present or prospective breeder of Angora goats, my whole desire being to keep men off the 'rocks' and to ensure on their part reaping all the benefit they possibly can We hear to-day on all hands a good deal about breeding on right lines, and in the Angora goat industry there is no truth which to my mind is more sober and important than the gospel already set forth. I have talked to some breeders who have been to Bradford on a mission of inquiry, whose only ideas about mohair-growing seemed to be that all they have to do is to produce a fibre grown on an Angora goat, and whatever it is like they think it should do in meeting the wants of the trade. That may be some men's idea of mohair, but it is not the idea of users, and some of our largest buyers have rather strong fears of having by and by a deluge of mohair little better in quality than pigs' bristles. In these days it will never do to think that anything will do, for the law of the survival of the fittest will operate powerfully in mohair markets by and by. Anything will not do, and the next move that is likely in the mohair world will be for qualities of a far different character to what we have seen these last two years—a demand which at present seems to have about run its course. Very coarse mohair has simply been selling because of a freak in fashion, but that is now altogether off, and there is a tendency for the pendulum to swing in the opposite direction. Everybody wishes that the pendulum would gain some speedy momentum, and solve the problem of the present extreme quietness which prevails in the article."

MILKING TESTS AT THE EXHIBITION.

The following is the result of the milking test. The milking took place at 7 a.m. and 5 p.m. on Wednesday and Thursday:—

Cow yielding the largest quantity of butter fat in forty-eight hours (Babcock tester).—W. Hartley's Daisy, 1; Frank Whittread's Lady, 2; Queensland Agricultural College (Gatton), Mona, 3.

Plate VIII.



A Useful Cow-bail.

Special prize, trophy, valued £3 3s., presented by Lever Bros., Limited.—W. Hartley's Daisy.

Special prize of £2 2s., presented by Lowood Creamery Company, Limited.—Frank Whittread's Lady.

Special prize of one bag of Stanley's Food, valued £1 5s., presented by R. W. Thurlow and Co., Limited.—Frank Whittread's Lady.

Cow yielding largest supply of milk in forty-eight hours, subject to result from Babcock tester, of not less than 2.8 per cent. of butter fat.—W. Hartley's Daisy, with 109½ lb. of milk, 1 ; Frank Whittread's Lady, with 94½ lb. of milk, 2 ; Queensland Agricultural College (Gatton), Mona, with 83½ lb. of milk, 3.

Special prize of £5 5s., presented by the proprietors of the *Sydney Mail*.—W. Hartley's Daisy.

Special prize, order value, £2 2s., presented by Butler Bros.—W. Hartley's Daisy.

The following are the details of the test:—

—	Weight of Milk in Lb.		Percentage of Butter Fat per Cwt.		Butter Fat per Lb.	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
			FIRST DAY.			
Gatton College, Roany ...	22½	14¾	2.8	4.3	.63	.63
F. Whittread's Lady	27	20¾	3.3	4.4	.89	.91
G. Franklin's Crummy ...	29	18¼	3.0	3.8	.89	.69
J. Reid's Rosalind	15¼	11	4.2	5.2	.64	.57
J. Carr's Nelly	16¾	14	3.4	4.8	.57	.67
W. Hartley's Daisy	24¾	30	2.6	4.2	.64	1.26
P. Ryan's Bluebell	20½	18¾	2.6	5.8	.53	1.08
Gatton College, Mona ...	25	18¼	3.6	4.8	.90	.81
Gatton College, Rose	24	16¾	3.4	3.8	.81	.63
			SECOND DAY.			
Gatton College, Roany ...	20¾	14½	2.8	3.8	.59	.55
F. Whittread's Lady	26¼	20½	3.2	4.4	.84	.90
G. Franklin's Crummy ...	27	18	3.3	4.0	.89	.72
J. Reid's Rosalind	14¾	12¾	5.0	5.8	.73	.74
J. Carr's Nellie	15¾	11½	3.8	5.4	.59	.62
W. Hartley's Daisy	30	24¾	2.0	4.3	.60	1.06
P. Ryan's Bluebell	16½	17½	3.0	4.6	.49	.80
Gatton College, Mona ...	23	17¼	3.8	4.8	.87	.82
Gatton College, Rose	20½	15½	3.0	3.8	.61	.58

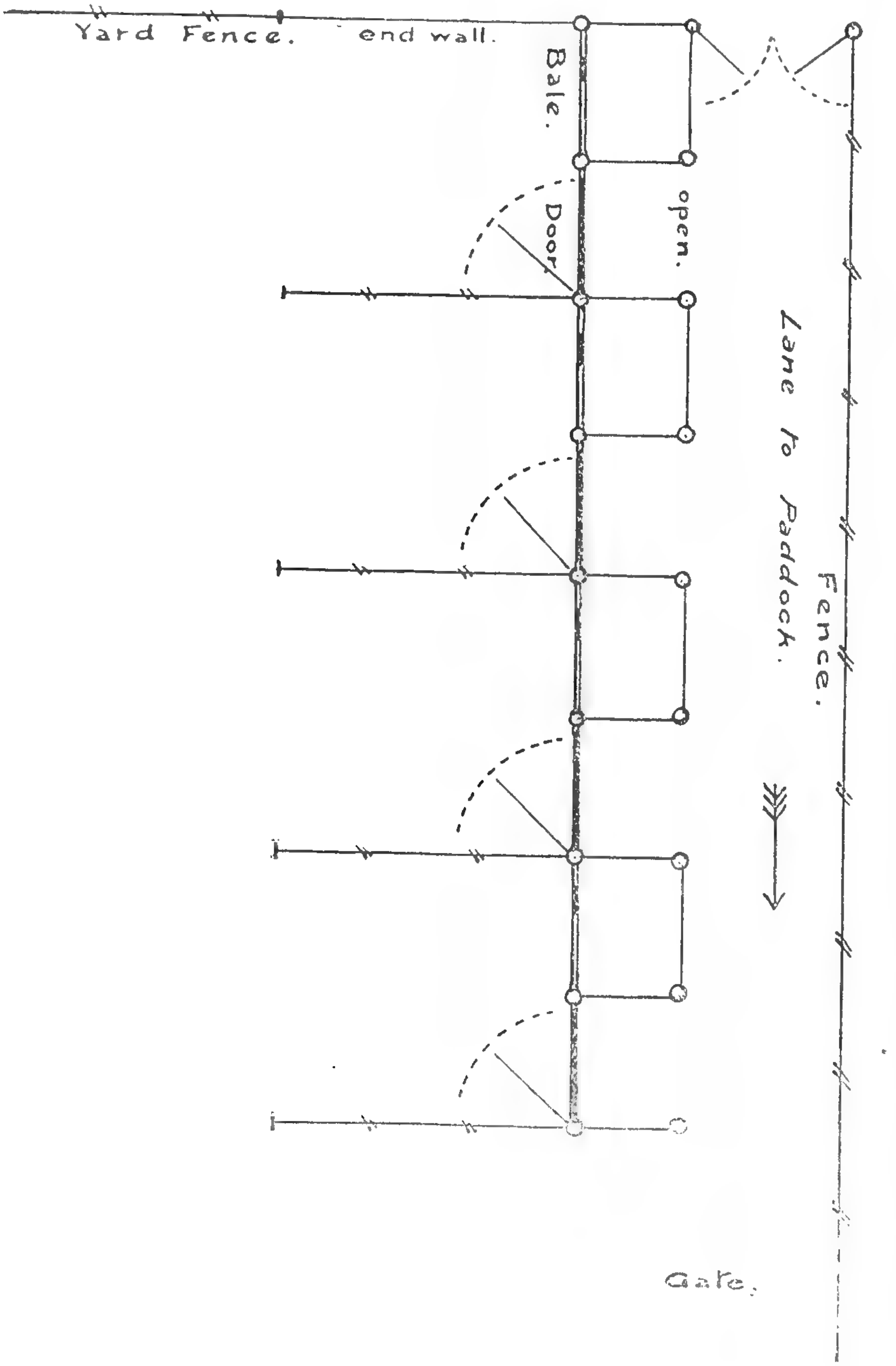
AMOUNT OF BUTTER FAT.

Daisy.—First day, 1.90 ; second day, 1.66 ; total, 3.56.
Lady.—First day, 1.80 ; second day, 1.74 ; total, 3.54.
Mona.—First day, 1.77 ; second day, 1.69 ; total, 3.46.
Crummy.—First day, 1.56 ; second day, 1.61 ; total, 3.17.
Bluebell.—First day, 1.61 ; second day, 1.29 ; total, 2.90.
Rosalind.—First day, 1.21 ; second day, 1.47 ; total, 2.68.
Nellie.—First day, 1.24 ; second day, 1.21 ; total, 2.45.
Roany.—First day, 1.26 ; second day, 1.13 ; total, 2.39.

AN UP-TO-DATE COWBAIL.

Mr. G. S. Thomson, Government Dairy Instructor, has handed to us the accompanying model and description of a cowbail and convenience for passing a cow into the yard after being milked, which was devised and is used by Mr. Geo. Riddoch, of Koorine, Kanlangadoo, South Australia. We are also enabled to give a plan of Mr. Riddoch's cowshed, fitted up with the new style of bails, the number of which is only limited by the length of the shed and the number of milkers required. Mr. Riddoch's milkers get through ten cows an hour on an average. Taken in conjunction with the illustrations of the model, the arrangement of the shed requires no interpretation. The illustration of the model bail

is on the scale of $\frac{3}{4}$-inch to 1 foot, the width of the stalls being a little over 6 feet. The middle of the building is 12 feet, this being sufficient to allow of bays being boarded in, say, 3 feet in depth in front of the bail, the door being on the same line as the bail, say 3 feet from the back wall. The cows go out of the shed into a lane or race, which has a gate at each end. Cows can be let into a paddock at either side as soon as milked. The shed, as well as the adjoining yard, is paved or blocked on a slope, which admits of water cleansing by gravitation.



The Orchard.

A MONOGRAPH ON THE NATURAL CAUSATION OF DWARFING; THE ENDS SOUGHT IN ARTIFICIAL DWARFING; THE METHODS EMPLOYED AND THE CONDITIONS FAVOURABLE TO THE SYSTEM WHEN APPLIED TO DIFFERENT SPECIES AND VARIETIES OF ECONOMIC FRUIT TREES.

By C. BOGUE LUFFMANN, Principal, School of Horticulture, Melbourne.

The objects of dwarfing are twofold—(*a*) miniature ornamental trees are sought, and (*b*) trees are required to fruit freely within limited space.

In practical horticulture, dwarf fruit trees are confined to cool regions, and to such peoples as furnish highly skilled labour at very low cost.

As artificial dwarfing by combination produces a constitutional weakness, and thereby curtails the normal life of any species of tree, it is not to be encouraged in regions where Nature acts against the development of a plant.

The variation in size, form, habit, and physical constitution of trees is due to their individual capacity to imbibe different proportionate properties of the food elements of the soil. Hence the cells vary in shape, size, and nature of their chemical contents, and the result is seen in a peculiar *bias* or type in each individual raised from seed.

Man long ago discovered that by joining two woods of different cell formation he interrupted the circulation of the sap of each part, and thereby brought about an extra condition, owing to its slower circulation under the influence of solar heat, air, and light.

To secure vigour, sap must move rapidly; to secure fruitfulness, sap must move slowly and experience long exposure to the outer elements and phenomena above the surface of the ground.

The coarse-grained tree grows too rapidly to fruit freely—the close-grained tree sometimes too slowly to fruit freely, and last long; hence the philosophic basis for dwarfing—to secure a size, quality, and degree of vigour in the tree conducive to regular fruiting.

In a secondary way, dwarfing is resorted to where a great many varieties of trees are required on a limited area, though usually this secures trees only, and not uniform fruiting, as some kinds are thrown out of balance, and cannot perform their complete functions on dwarfing stocks.

What are known as "dwarfing stocks" are, without exception, small in the cell, close in the grain, hard of wood, and thin of bark, and usually, though not always, small of leaf. These are the characteristics of a dwarf as against every free-growing tree of the same species.

A chemical analysis of dwarf plants would show them to possess very little of some and preponderating quantities of other elements, all of which are more evenly distributed in free-growing trees of the same species. This irregular composition leads to some stocks proving what may be termed *refractory*—they hold so little of the substance required by the more highly developed "scion" that the latter refuses to "take" or join with its inferior relation. The disparity exists also in another form—the small-celled type cannot effect a true physical union with the large-celled type, the cells being as 3 to 5 or 1 to 4; hence a constant folding and rupturing of the cells at the desired point of union, such as would occur in endeavouring to make a 1-inch pipe take the contents of a 2-inch, or to force the 1-inch volume with uniform speed into the 2-inch.

The sap of different plant bodies travels at different rates of speed and at different angles or spirals, and compounds itself differently in the course of its progress.

The most minute changes above or beneath the surface lead to the most varied results when sap, made under a given set of conditions, arrives at

premises where its speed, and the phenomena surrounding it in the nature of solar heat and light, vary.

Each type of wood joined to a different type preserves its *outward* characteristics, and, in large measure, its inward nature, but more or less, and according to species and variety, stocks influence scions, and scions stocks; and the size, colour, flavour, and keeping qualities of fruit vary according to the nature of the stock on which it is grown.

Dwarfing stocks are credited with causing fruit to grow to a greater size, which is true in some instances, owing to their steadying the flow of crude sap, and thereby ripening and furnishing the class of viscid and sweetened sap on which fruit imbibes its sustenance during its finishing stages.

Dwarfing stocks also induce fruitfulness by reason of their roots being near the surface and almost entirely in aerated soil, and, as complete sap is manufactured only within the aerated depths, it follows that a shallow-rooting tree or plant will be smaller in its wood and more fruitful than such as mine for sustenance and furnish strong branches supported by coarse unripened sap.

The nature of the soil, its depth, aspect, degree of humidity, and the proportion of summer to winter, determine the degree of vigour required in economic fruit trees.

In ordinary practice, apples, pears, plums, and cherries are dwarfed, but never with reason and of necessity in tropical or warm temperate regions (unless at considerable elevations). The only exception which can possibly be made refers to pears, which, if given a permanently moist deep soil, will bear dwarfing through the medium of quince stocks, and, if the whole of the stock and *graft union* be buried, trees so made will thrive and endure for many years.

Dwarfing may be induced by a variety of ways and means:—

By *cross grafting*—a root system of dwarf habit carrying the more robust type from which fruit is derived.

By *double or intermediate grafting*, which employs three types of wood, the intermediate sections serving to join two types which are incapable of uniting (refractory).

By late planting and regular checking of growth in summer.

By increasing normal length of trunk, and thereby extending the main sap channel, which, paradoxical as it may seem, carries less sap than a short trunk.

The larger the pieces of wood employed in effecting the union, the weaker the tree. This is owing to a wider diffusion of sap, and therefore greater waste before the two parts can serve each other. Hence, very weak stocks and scions are "worked" with wood holding but a single bud, whilst strong types are given long wood grafts in order to dissipate and restrict the sap flow.

In grafting, it is the rule, governed by the material and forces at work, to provide a *dwarf root system;* and it is rare indeed to find dwarf types succeeding on "free" root systems, such combination invariably proving refractory, whilst in the reversed positions the union may be large and constant.

The softer the wood employed in grafting, the greater the vigour of the resulting tree, since sap flows through the entire diameter of very young woods; and it follows that the greater the facilities for conducting sap, the greater the vigour of the general body of the tree.

The union of weakly and strong natures may be effected by both budding or grafting. Budding produces the more vigorous plants, owing to the bud being younger than a graft, softer, and *nearer* to the source of supply. Hence it has a direct pull on the foster stock, and, being unencumbered by any hard wood of its own, draws freely and more continuously than can the buds springing from a woody graft.

Grafting is, therefore, a more or less dwarfing influence, and the larger the graft, the older, harder, and weaker its wood, and the more developed its buds at the time of working, the weaker the tree it will furnish.

The actual work of grafting to produce dwarfs may be carried out at any time between July and September (Australian conditions). If done in the dead

of winter, the points of union must be waxed, greased, or coated with some material which will not burn the bark, or stick permanently, and yet will completely exclude the air.

But if the work is done in spring, when the sap is moving, the "knitting" powers of the sap will be so prompt as to necessitate no more than a tie which will keep stock and scion firmly held together.

So far as the actual work of making dwarfs, they are produced by ordinary methods of grafting, the nature of the materials, their size, and arrangement being governed by the principles here set forth.

Finally, I beg to suggest that your Government does not advocate the dwarfing of economic fruit trees (except the pear, which would probably succeed well enough in all the higher and cooler parts of the extreme South of Queensland). The Queensland orchardist will certainly not discover his deciduous fruit trees unprofitable through excessive vigour.

THE BEE AND THE ORCHARD.

In an address to the Georgia State Horticultural Society, by Professor Wilmon Newell, the latter emphasised the value of bees to the orchardist. "The more abundant the bees, the more thorough will be the cross-pollination of our orchards, and, as a result, the better will be our crop. This," he said, "was shown by the observation and experience of many fruit-growers. Insects," he said, "are essential for the pollination of fruit bloom, and the honey bee more thoroughly accomplishes this end than any other insect. Although bees take part in disseminating pear blight and brown rot, yet these diseases would be practically as prevalent even where there are no bees."

With regard to bees puncturing the skin of ripe fruit, we have frequently been asked if this is really so. There seems to be an impression amongst some of the orchardists in this State that bees, in search of honey, eat away the heart of the blossom. Our own experience conclusively proves that the honey bee cannot be charged with any such nefarious proceeding. Common sense also should point out that, if the insect destroyed the blossoms or perforated the skins of fruits, the orchardists of the old and new worlds would long since have notified the fact to the world, and bees would have been classed as a pest equal to the fruit fly.

This question we submitted years ago to Mr. H. Tryon, Government Entomologist and Vegetable Pathologist. That gentleman wrote an article on the subject, which was published in this *Journal* in January, 1898. It is too long for reproduction here. He gave instances in which the bee was distinctly charged with gnawing the surfaces of fruit and then imbibing the juices. A practical fruit-grower of Willoughby, Ohio, the late Mr. H. G. Tryon, who kept many colonies of bees, recorded that "they attack certain varieties of peaches with great avidity, working through the skin and eating into the flesh."

On this the Entomologist, Mr. H. Tryon, remarks: "The alleged damage to the orange that is attributed to the bee does not partake of the nature of any of the forms of injury above described." Mr. Tryon then goes on to describe the pollination of the flowers by insects and the self-pollination of the orange, and states that there is no ground for concluding that the orange differs from other fruits—including the pear and apple—in the benefit that accrues in their case generally from cross-fertilisation. If this latter is commonly effected by bees, this favourable result must be attributed to their habit of visiting the flowers, and thus they not only accomplish a useful act—*i.e.*, pollination—but also the most serviceable form of those processes coming within this definition. Mr. Tryon's final conclusion is, that bees, in so far as they frequent orange blossoms, are beneficial to the orchardist rather than prejudicial. Still, authorities differ. One declares that the mouth parts of the honey bee are so constructed that it never punctures, bites, or lacerates the skin of sound fruit. Another, Professor Josef Jablonowsky, State Entomologist at Buda Pesth, said

that all the evidence known to him was against the charge, and that none of the observations at and near Buda Pesth gave the least support to it. He then visited the scene of the alleged crime, and completely changed his view. He said there was no doubt that the bees were guilty as charged. But, in extenuation, it was said that there was absolutely nothing else for them to eat at that season in a semi-arid region, where there are no flowers after midsummer. The mouth parts of a bee, while beautifully adapted for gathering nectar, have also well-developed jaws or mandibles, and there is absolutely no reason why they should not puncture ripe fruits to get at the juices, if there is nothing else equally attractive. The professor, in conclusion, said: "I am a believer in bees, and frequently suggest keeping them in large orchard areas. Their work in securing a set of fruit far outweighs the little mischief they may cause on ripe examples. Keep bees by all means, the trees need them. I do not believe that the fruit-piercing habit is at all a normal one, and, so far as my own observations go, I have never seen a bee on any fruit not previously injured by some other cause. I would be always inclined to seek a prior break rather than consider the bee guilty."

The only orange-grower we have ever heard of who investigated the matter in this State said that, when a bee is seen drawing juice from an orange, it may be safely set down that that orange has first been perforated by the orange moth. If orchardists would only exercise the faculty of observation a little more, and publish the results of such observations, they would do far more good to the community than by asking questions on what is going on under their own eyes.

GROWING STRAWBERRIES IN CASKS.

Some four years ago Mr. F. W. Peek described a method he had successfully tried of growing strawberries in a cask having holes bored in it, as shown in the illustration—

This plan was adopted by Mr. J. Jackson, of Taringa, and the result of his cask garden is also depicted here. When the planting season comes round, the cask is filled to the level of the lower holes with a rich compost. A root is then planted at each hole, with the crown protruding through it. More soil is then filled in, until the next tier of holes is reached, when more plants are put in in the same manner, until the cask is full, and every hole has a plant. In Mr. Jackson's case, the plants throve remarkably, and bore a heavy crop of fruit about ten weeks after planting. The crop came in a month earlier than from the plants in beds. Another advantage is, that by means of this Babylonian hanging garden a base of 2 feet in diameter will carry far more plants than a bed covering 30 square feet. Those whose garden space is limited should certainly try this plan. An improvement on it, Mr. Jackson says, would be to allow the barrel to revolve on a pivot, so that all the plants could be turned to the sun in turn.

Plate IX.

Strawberries Growing in a Perforated Cask.

Tropical Industries.

HOW TO INCREASE THE DEMAND AND THE PRICE FOR QUEENSLAND TOBACCO.

R. S. NEVILL.

In the *Agricultural Journal* for July the experiments of Dr. Trobut, of Algeria, were published on the subject of selection and improvement of the tobacco plant, the importance of which I called attention to. It is a well-known fact to old and observant growers that when fresh seed is introduced into a new country, the type breaks up and the plants are extremely variable, with a tendency to revert to local types. Of this I have written before, and have also, in conversation, called the attention of growers to the fact.

The soil and climatic influences no doubt have much to do with this, but the complete reversion is hastened by mixing with local seed. That a complete change of type in time will occur is doubtless true, but that these changes can be directed towards better varieties than is common to the locality is also true, if the careful protection of seed plants from inoculation and the careful selection of seed plants true to type are persisted in, until the plant has become thoroughly acclimatised.

How to resist this deterioration is shown by Dr. Trobut in putting the seed into water and sowing only those that sink, thus getting only the very best and hardiest plants, and, when selecting seed plants, let every plant be of the type desired, and not taken haphazard in the field because the plant is vigorous. Vigorous plants, of course, must be selected, but they should be all of exactly the same type or variety.

If this is done, we can secure good and uniform varieties for our tobacco-growing districts, which is certainly desirable, for the sorts now usually grown in Queensland were discarded in the United States thirty years ago by every trade except that of the West Coast of Africa. The best varieties for us to grow in this State are the old fixed types—what fruitgrowers would call seedlings—such as readily adapt themselves to soil conditions for dark or bright colours, for the reason they are more hardy and their characteristics strongly fixed, and hence less liable to deteriorate, whereas new varieties, when removed from their habitat, are not likely to prove so resistant. Herewith is given a list of old and new varieties that are popular in the United States, and what Mr. Killibrew, who is an authority, says of them:—

Old Varieties.

Lacks.—Heavy weight on strong soils; used for making yellow tobacco in Virginia and heavy tobacco in Kentucky. Well-coloured, broad leaf, fine fibre, a strong grower. *Kentucky and Virginia.*

Yellow Pryor.—Heavy wide leaf, fine texture, fine bright colour, tough, and weighs well. Wrappers and fillers.

Blue Pryor.—Large fine leaf, long and well-proportioned, good colour. Grown in Virginia, North Carolina, Kentucky, Tennessee, Missouri, and Indiana.

Gooch.—Broad round leaf, leaves thick on stalk. Yellows on hill when ripe, cures easily. Fancy, bright, export and domestic smokers and wrappers. A favourite variety in North and South Carolina.

Later Varieties.

Hester.—Broad-shouldered, heart-shaped leaf, fine fibre, silky, and cures bright. A great favourite in North and South Carolina for yellow tobacco.

White-stem Orinoco.—Leaf long and slender, drooping, tough, and fibrous. Largest leaf grown. Yellow plug wrappers, strips, and shipping leaf. Grown in Virginia and North Carolina.

NEW VARIETIES.

Ragland's Conqueror.—Mahogany and yellow.

Ragland's Improved Yellow Orinoco.—In recent years planted extensively for yellow tobacco.

Tobacco seeds will retain their vitality for eight or ten years, if properly dried and put into dark glass bottles, thoroughly dried out, sealed, and kept in a dry place. It is advisable, when the first crop is grown from new seed, to turn out enough seed plants to supply the seed likely to be required for six or eight years; by this means the grower can rely upon getting for a number of years the same tobacco, and reversion in his product will be a very slow process, as for that length of time he will have seed only one remove from the original, and, when they are exhausted, repeat the process.

I have gone thus fully into the matter because it is important, if we desire to continue the industry, and we cannot improve our tobacco if we do not improve the seed; and if the tobacco is not improved, we must in time lose our supremacy in the trade, for the manufacturers condemn it, and they are the court of last resort.

The question of variety is an important one, but it is not the only one, nor is it more important than proper curing and handling after the tobacco is grown. In the *Agricultural Journal* for April, 1902, was published an article by me under the heading "How to Secure and Retain a Good Market for Queensland Tobacco." The following suggestions were made, and they are of equal force now:—

"Now that federation is accomplished, and the demand for tobacco from Queensland by the other States is assured, it is well for us to take into consideration how we are to increase the demand and supply it. If we fail to sustain the reputation that our product has acquired, this demand will cease as quickly as it came; but, if we use our best efforts to improve the quality and meet the requirements of the manufacturers, the results will be satisfactory to both growers and buyers; and if we do not make this effort, and give them the very best the country will produce, they will be unable to produce an article satisfactory to the public, and will be forced to seek elsewhere for something that will give this satisfaction. It will not do for us to be satisfied because the present margin of profit is good; we must seek to make it better, by making our product indispensable to the buyer; and only in this way can we be assured of a permanent and profitable market. Rubbish can be grown anywhere, but good tobacco cannot. The question then is, how to accomplish this—

1st. By building better sheds and taking more care in curing the crop.
2nd. By properly handling it after it is cured."

Many farmers may say they cannot afford to put up good sheds. They do not take into consideration that the good sheds will pay for themselves; that tobacco properly cured in properly constructed sheds will always bring the top market prices, and be first sought by the buyers; and, if there is more tobacco in the country than buyers want, the well-cured and well-handled tobaccos will be given the preference.

If we will supply the manufacturer with what he wants—and we can if we will only try—there will be a demand for more than can be supplied for the next six or eight years, with plenty of competition in the buying. If the growers will do their duty, the tobacco industry, in a few years, will be one of the most profitable to the farmers, and as valuable to the State as any we now have.

As to the manner of curing, it does not concern the manufacturer. He wants it well cured, something he can work profitably to himself and satisfactorily to his customers; he knows that when he sees it he will buy it at good prices, for it pays him to do so, and if we have not what he wants he will go elsewhere. It does concern us, for we want a market for our product at remunerative prices, and we shall need a largely increased production to satisfy the demand if we cure and handle properly.

To cure bright or yellow lemon-coloured tobacco, the flue-cure process is the only way in which to do it successfully, but this tobacco *cannot* be grown upon the dark heavy soils, but must be grown upon light sandy or what would be called poor ground, and should be planted and harvested as early as possible. Tobacco grown upon such soils and cut early, if allowed to cure by nature's process, will have a fair amount of colour ordinarily, but the flue-curing, properly done, gives definite results.

To cure bright red, red and dark, any process in practice, either artificial or natural, will give good results, if properly done.

It is a well-known fact that the colour of tobacco depends upon the soil—the heavier and darker the soil, the heavier and darker will be the tobacco; the earlier in the season it is harvested, usually the better the colour will be; so it is always advisable to get the crop out as soon as possible; late crops are gummed and thickened by the cold dewy nights, and will not cure light colours.

It should always be fully ripe before cutting; if cut green, it will not cure well by any process, and never make a valuable product.

Open sheds are decidedly objectionable, especially so in this State, where high winds prevail during the curing season, and closed-in sheds are necessary that the tobacco may be protected from the winds, and that the conditions prevailing in the sheds may be uniform, which is important; and last and most important is, that the tobacco should never be crowded on the sticks or in the shed—hang it well apart on the sticks, bearing in mind if you do not you will have much green which has little value.

EGYPTIAN COTTON NOTES.

A correspondent of the *Weekly Times* writes from Alexandria, 17th June:—

The announcement in a New York journal that Mr. Leigh Hunt, the wealthy planter who is engaged in experimenting in cotton-growing in the Soudan, will, by Government authority, import 12,000 negroes from the United States into Egypt, is somewhat fallacious; the correct number is 80. It is needless to say that the land in its present condition would barely support a sudden influx of immigration on anything like the scale suggested. But a remedy must be found for the scarcity of labour in the Soudan, which is highly detrimental to its progress, and the trial of negroes possesses, therefore, more than an ordinary interest and significance. Widespread satisfaction is felt in Egypt, and particularly by the native cultivators and peasantry throughout the Delta, at the abundant supply of water experienced this month, usually the driest of the year. Though the irrigating canals are almost as full as in October, a pentiful reserve exists in the Assouan reservoir, which holds three-quarters of its *maximum* capacity, while the gauge readings in the upper reaches of the Nile indicate an exceptionally high flood for the coming season.

THE COTTON WORM.

It is clear that the extinction of the cotton-growing industry in Queensland many years ago was not followed by the extinction of the cotton caterpillar or worm, as the Americans call it. This pest can, however, be kept in check by the use of Paris Green. The best strength for this spray as a dust is found to be 1 lb. of Paris Green to 10 lb. of dry lime. Some say that 1 in 6 is the best proportion. The amount required per acre will, of course, vary according to the number and size of the plants; 1 lb. will serve for from half to 1 acre.

When used as a liquid spray, 1 lb. of Paris Green with 3 lb. or 4 lb. of lime to 100 to 150 gallons of water has been found effective.

All cotton-growers should keep a supply of Paris Green on hand, as the caterpillar is almost sure to make its appearance in the fields, and he who has his remedy ready will be the most fortunate with his crop.

WILFUL DESTRUCTION OF COTTONS.

There seems to be no limit to the ingenuity shown by some people in effecting crime. In the Sixteenth Annual Report of the Louisiana State University and Agricultural and Mechanical College occurs the following paragraph:—

It is with deep regret that we have to chronicle the destruction last summer of all the varieties of cotton grown on this station. Some miscreant placed in our field the Mexican boll weevil, and to successfully exterminate it when found in August last it was deemed necessary to destroy every stalk of cotton on the station. The cottons were pulled up by the roots, immersed in petroleum, and burned. The fallen bolls and squares were carefully picked up, saturated with petroleum, and also burned. Petroleum was sprinkled over the soil, after which the latter was carefully ploughed, harrowed, rolled, and oiled, reharrowed, rerolled, and reoiled. Then the land was flooded and kept under water for five days. The weevils were thus exterminated, but at a great sacrifice and large cost. Nearly one hundred varieties, secured from Egypt, India, Japan, and this country, at a great cost of time and money, were destroyed in a few days.

Pedigreed cottons, upon which the labour of years had been devoted in order to combine productiveness with excellence of staple and vigour of growth, were consigned with the rest to the flames.

CASSAVA STARCH IN JAMAICA.

Reference is being continually made in the West Indian journals to the cassava starch industry. The *Agricultural News* of Barbados makes mention of a trial shipment which was made by Mr. J. W. Middleton, who had started a factory for the manufacture of this starch at Longville, Clarendon. Of the result of this shipment, Mr. Middleton was notified by cable from Manchester. The starch was put through several tests there, and the results of the trial have been very satisfactory, and he has been asked to send at the earliest opportunity 50 tons, for which a price of £10 per ton in Bristol is offered.

Commenting on this report, the Jamaica *Daily Telegraph* remarks that it is conclusively shown that there is a bright future for the cassava starch industry, for, considering the cheapness with which cassava can be grown and the moderate cost at which the starch can be manufactured, there is money in the new venture.

It is stated that the manufacturer has succeeded in making a starch to suit the finishers of high-class goods in Manchester, who at present use, for their finer processes, wheat starch, which costs, on an average, £27 per ton.

The cultivation at Longville consists of about 50 acres, which will be ready for starch-making this season. The capacity of the plant is about 150 tons per annum.

With reference to the general characters of cassava starch for laundry purposes, the following report from a laundry in England is of interest:—

I have tried the sample of starch you sent me, both boiled and unboiled. One tablespoonful of your starch is equal to two of mine; it is very glutinous. The cold starch, when used with borax, is certainly stronger than the starch I have been using, but it is inclined to stick to the iron and on the outside of the collars, &c. The starch is a good colour. It could be used for starching without borax, as it is very stiff, and *also gives a gloss.*

The cassava-growing business in Queensland is as yet a long way from the point when it may justly be dubbed an "industry," but, as we stated in our last number of the *Journal*, the matter is being taken up by intelligent men, and we hope that the results from Mr. T. H. Wells's cassava patch at Childers will be such as to encourage others to go in largely for a product for which there is a very large demand in the manufacturing centres of Europe.

BOWSTRING HEMP.

This is another name for African hemp, which is principally obtained from *Sanseviera zeilanica*, of the Liliaceæ family. This plant is a native of Ceylon. It is very long-lived, has no stem, and throws up thick, fleshy leaves from the ground, 2½ to 3½ feet long. It is propagated by suckers from the roots, and only requires renewing at a long interval of years. From 40 leaves, a yield of about 1 lb. of clean fibre is obtained, from which it is stated that 1 acre will produce about 1,700 lb. weight of fibre.

A small quantity of bowstring hemp made from the *Sanseviera guinaensis*, a native of Africa, finds its way to Europe.

A sample of it recently sent to London was reported upon as being too short to be extensively used for rope making, but was beautifully fine, and at present market values was worth from £30 to £35 per ton.

THE CULTIVATION OF CASSAVA—ITS CONVERSION INTO SUGAR.

Referring to a pamphlet on the above subject by Mr. Robert Thomson, shewing what is being done in Florida, U.S.A., in the matter of cassava-growing, Dr. James Neish, M.D., of Old Harbour, Jamaica, writes to the *Journal of the Jamaica Agricultural Society* as follows:—

In the course of my professional avocations, I see much cassava-growing in what would appear to be its natural haunts—namely, Clarendon and Saint John. The long-continued dry weather in these districts, lasting from August through September into October—for the autumnal rains have not yet fallen—has caused a retardation in the maturing of the crop. Cassava should have come into the market fully two months ago, and the tubers that are now being lifted are small in size, and so stringy by the development of fibro-vascular tissue at the expense of the starch, that they are scarcely fit for the table. However, the peasant women continue their preparation of starch, and this article will soon make its appearance in the markets.

Cassava starch is much undervalued in the island as an article of infant's food Prepared with boiled milk it is highly digestible, and should be freely given to young children. Mixed with even a small proportion of ground malt its digestibility is increased, and it then vies with more expensive articles that are much advertised. To make a market for this starch, it should, I think, be converted into starch-sugar or glucose. There is a demand for glucose which the Americans have found out, for brewers use it in brewing ales and beer, and confectioners employ it in preserving fruits, in making pastry, barley sugar, and other sweetmeats. In the very valuable work on "Sugar Growing and Refining" by Messrs. Lock, Wigner, and Harland, there is a chapter of some 22 pages on starch-sugar and glucose, giving very clear directions as to the different processes in use for its manufacture, some of which are very simple, requiring no great outlay for apparatus. The most simple apparatus is that known as Anthon's. Sulphuric acid and bone-black are required in the process, but the other substances we have here in abundance—namely, starch—produced more cheaply than corn-starch can be produced in the Western States of America—quicklime and chalk, the latter existing here in the form of white marl.

What follows is quoted from the work mentioned:—In Anthon's method for producing 3 to 4 cwt. of starch-sugar per twenty-four hours, the ingredients for boiling are—

370 lb. of air-dry starch.
11 lb. of sulphuric acid of 66 degrees Beaumé.
3 lb. and 7-10ths of bone-black.
2.46 to 3.70 lb. of pure burnt lime.
4.95 lb. of prepared chalk.

The apparatus is very simple. It consists of a boiling pan, a vat of about 8½ bushels capacity, with a wooden spigot at the bottom; a Taylor's filter in a case 4 feet high and 2 feet wide and deep, arranged for the reception of 9 bags, each about 2½ feet in length and 6 to 7 inches in diameter when filled, and set up so that the thin liquor can be drawn off into a cask. The bags are made of grey linen of prime quality and of uniform weft, and are fastened over funnels placed in the bottom of a syrup-containing box with a strong cord. It is stated in America the cost of manufacture is about 1 cent (halfpenny) per lb. Some 26 lb. to 32 lb. are made from a bushel of corn. It is sold by the manufacturers at 3 to 4 cents (1d. to 2d.) per lb.

The authors quoted also give directions for the preparation of starch-sugar on a larger scale by Anthon's process, which, it is stated, furnishes excellent sugar. They also state that starch-sugar is principally used for manufacture of table-syrups, candies, as food for bees, for brewing, and for making artificial honey. All soft candies, waxes, and toffies, and a large proportion of stick-candies and caramel, are made of starch-sugar syrup. Small quantities of starch-sugar syrup are used by vinegar-makers, tobacconists, winemakers, distillers, mucilage-makers, and perhaps for some other purposes.

All readers interested in the proper utilisation of cassava in Jamaica should consult the valuable work from which I have partially quoted.

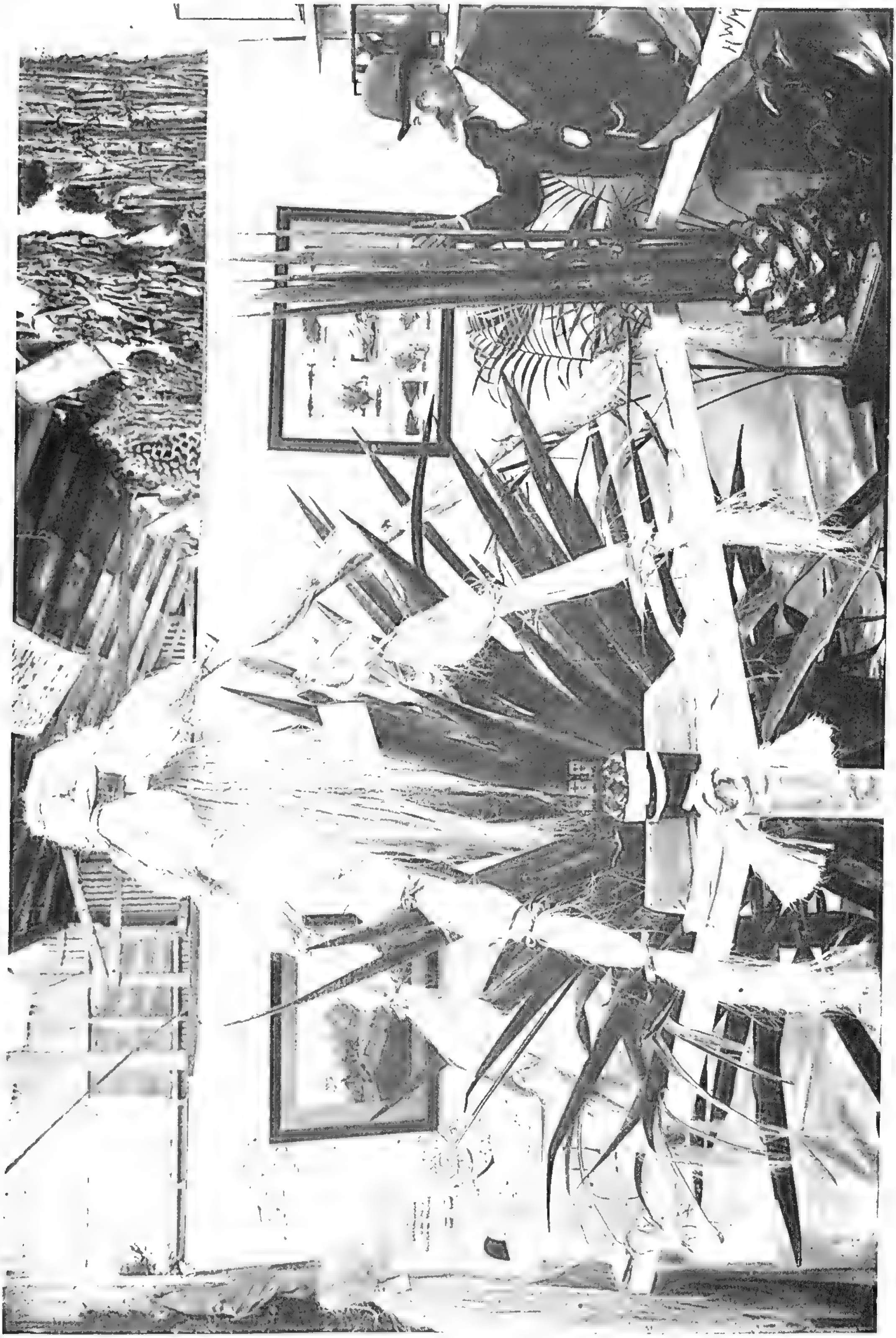
SISAL HEMP AT THE EXHIBITION.

The exhibit of sisal hemp at the late Exhibition from the Penal Establishment at St. Helena excited great and well-deserved admiration. Not only was the fibre beautifully got up, but the arrangement of the exhibit was so well done as to set it off to the best advantage. A well-grown plant was shown, and also a plant showing how the leaves are harvested. The fibre was stretched over the plant in long hanks, tied at intervals with blue ribbon. There was also a piece of rope neatly made of sisal hemp, and several leaves partly scutched, in order to show the amount of fibre contained in each. During the three days of the Exhibition, an officer of the Department of Agriculture attended at this section, and gave valuable information to the numerous inquirers as to the cultivation of the plant and manufacture of the fibre. Diagrams were also shown of several sisal hemp scutching machines. The authorities at St. Helena well deserved the unstinted praise given by the public to this interesting exhibit of a plant and industry which promise to assume large proportions in the near future. Mr. T. H. Wells's plantation at Childers, which is here illustrated, is at present the largest area in the State under sisal hemp, comprising 11 acres.

IXTLE FIBRE.

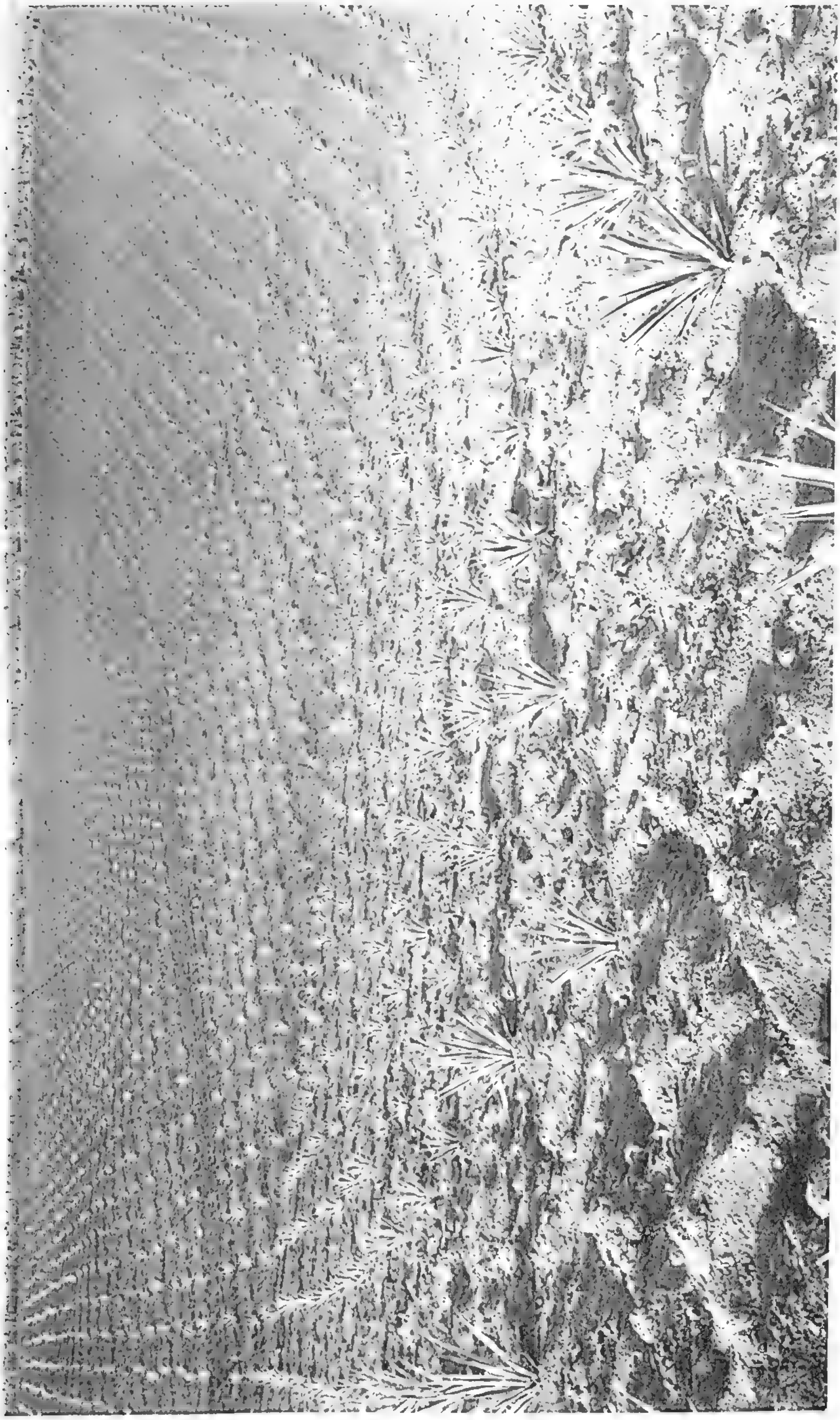
From 1897 to 1902, the annual exportation of ixtle from Mexico increased from 5,920,125 to 12,475,361 kilogrammes. In other words, in five years, the exportation of this important product has doubled. Ixtle is a strong fibre used for the making of ropes, coarse fabric, ore sacks, and the bailing of goods; also, to a certain extent it is used in the place of bristles in the manufacture of brooms, brushes, &c. It is a product of the smaller variety of the *Agave* plant called *Lechuguilla*, and only grows to advantage on the driest and most arid plains and low hills. Where water runs or stands, if it be for a few hours only, the ixtle plant will not thrive, but where good soil is found on rolling hillsides, level plains, or even on the sides of mountains where there is not too much declivity, it grows in great abundance. Each plant has a productive life of from eight to twelve years when properly handled. Formerly it was the practice of the Indians to entirely destroy the plant when gathering the leaves, but now,

Plate X.



Sisal Hemp Exhibit at Bowen Park from H.M Penal Establishment at St. Helena.

Plate XI.



Sisal Hemp Plantation at Farnbro', Childers.

among the more intelligent producers, a new system has been adopted, which consists in merely cutting out the centre leaves, leaving the plant practically unharmed. When treated in this way, they have a productive life of at least ten years, and, by the time that the plant is dead, numerous suckers which have been growing from the root will have attained a size to be productive. When only the centre leaves of the plant are cut, it takes about 60 plants to produce 1 lb. of merchantable fibre, and as in many ixtle districts from two to five plants grow on each square metre, or say from 8,000 to 20,000 plants to the acre, some idea can be formed of the productiveness of these ixtle lands. It is claimed that 1 acre of the best quality of ixtle land, when properly harvested, will give a net profit of 20 dollars (£4) an acre annually. As the plant requires no cultivation, and reproduces without cost to the owner, some idea may be formed of the value that this plant gives to large regions in Central Mexico, which, to the casual observer, appear arid plains and hills covered with cactus and thorny bushes.

It is rather difficult to explain the distribution of *Lechuguilla*. In travelling through the country where it grows, often hundreds of acres of land, seemingly well adapted to it, will be found without a plant, and then other lands, apparently of the same quality, and having the same conditions, will be so thickly covered as to make a mat that it is almost impossible to cross on foot or horseback.

For centuries (says *Modern Mexico*) the ixtle has been extensively used in this republic, but it is only within a few years that it has become an important article of export, so much so that inventors have devoted themselves to the production of machinery that will extract the fibre more economically and thoroughly than by the old hand process. These machines are now on the market, and appear to be successful. They are made in two or three sizes, and can be taken from place to place, something like a threshing machine. As in regions where the *Lechuguilla* is most abundant water is very scarce, they are moved, as a rule, by horse or mule power.

Lands that ten years ago could have been bought for from 10 to 15 cents an acre are now changing hands at from 3 dollars to 8 dollars an acre. The extensive production of ixtle is working material changes in the semi-arid regions of Central Mexico.—*Tropical Agriculturist*, Ceylon.

[The ixtle plant belongs to the *Bromeliaceæ*, not to the Agave family. Amongst the former is the pineapple, the only one of the family which is cultivated for its fruit.—Ed. *Q.A.J.*]

FIBRES IN INDIA.

At the annual flower show of the Agri-horticultural Society of Madras, held last February, special prizes were given for fibres, the produce of the Madras Presidency, Hyderabad, Mysore, Coorg, Travancore, and Cochin.

The first was a silver medal for the best collection of cleaned fibres, not less than 5 lb. weight of each, with plants either growing or as botanical specimens. The fibres to have been recently cleaned.

The second was a bronze medal for the best sample of Aloe (sisal presumably) fibre, not less than 5 lb.

A bronze medal was also offered for the best collection of plantain fibres, from varieties of plantains to be specified, 5 lb. of each variety.

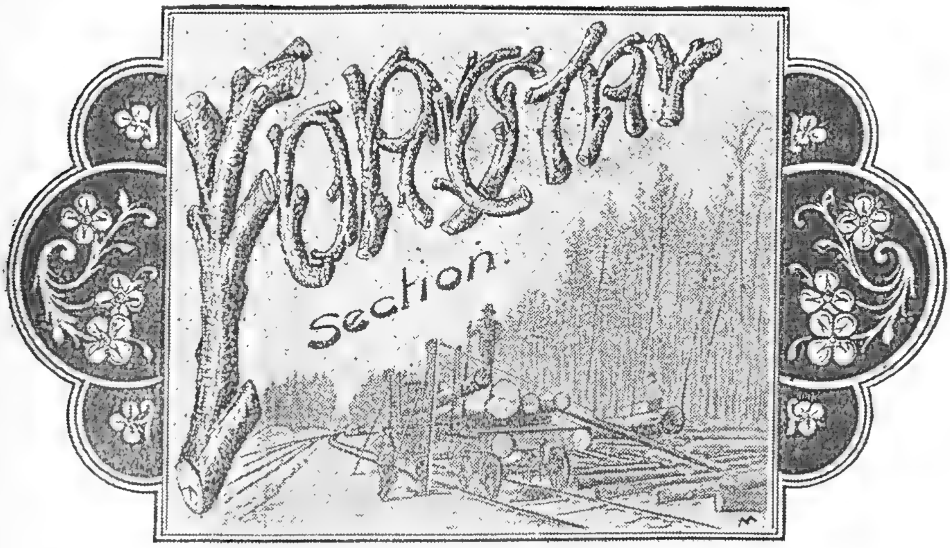
The judges, whilst commending the fibres, awarded none of the prizes, as the exhibits did not comply with the conditions, and many were not well cleaned. If such prizes were offered by the Queensland National Association, we venture to assert that there are many Queensland growers and others who would succeed in carrying them off. The St. Helena fibres certainly leave nothing to be desired, either as to growth of plants, length of leaf, and strength, lustre, and quantity of fibre.

AN IDEAL SUGAR-CANE.

In the April number of this *Journal* we printed an article taken from the *Southern Farm Magazine*, U.S.A., with the above heading. In this article it was stated that Professor Stubbs, Director of the Louisiana Experiment Station at Audubon Park, received some sugar-canes six years ago from Trinidad, which he classified as "T 95" and "T 74." The professor also gave some particulars of their value as sugar-producers. We have this month received a letter from Dr. J. B. Harrison, of the Government Laboratory, Georgetown, Demerara, British Guiana, in which he expresses astonishment at the statements imputed to Professor Stubbs by the *New Orleans Times-Democrat*. Dr. Harrison says:—"The canes mentioned were *not* received by Dr. Stubbs from Trinidad, but from British Guiana. They are *not* known as 'T 95' and 'T 74,' but as 'D 95' and 'D 74.' As I not only sent these canes to Dr. Stubbs, but raised them personally, I trust you will correct these statements." This we do with pleasure, as we are always careful to give honour to whom honour is due. The statement, however, was made in a high-class Southern journal, and we can only suppose that the reporter mistook T for D, and evolved Trinidad out of his own inner consciousness; for it is not to be thought for a moment that a scientific man of the standing of Dr. Stubbs would knowingly make a misstatement in such a case.

UTILISING SKIM MILK.

In many dairies and butter factories the question arises what to do with the surplus skim milk, and the solution of this problem may be found in a little machine at the annual exhibition of the Royal Agricultural Society at Park Royal last June, shown by Messrs. W. Meinhardt and Co., 3 Lloyd's Avenue, London, E.C., known as the "Crescent Emulsor." In its smallest size it measures only 18 inches by 14 inches by 16 inches, and yet is capable of dealing with 45 gallons of skim milk per hour. Instead of throwing skim milk to the pigs, it can be made into an emulsion by the addition of some kind of fat or oil, and used for feeding calves or for making semi-fat cheese. In other words, the fat which the cream separator has taken out of the milk in the form of cream can be replaced with the aid of this emulsor, a machine for adding various kinds of fatty substances to the skim milk. Thus taking a quantity of 500 gallons of skim milk, the average quantity of fat in the form of butter taken out of the whole milk is 4 per cent., and thus the same quantity of some other fat substance, as a substitute, can be added in order to replace the butter previously taken out of the whole milk. These fats may consist of raw margarine, cocoanut oil, palmitine, olive oil, linseed oil, or pork fat, according to convenience. The machine for mixing these with skim milk, the "Crescent Emulsor," resembles an ordinary hand separator, and is operated in the same way, simply by turning the crank acting on a ball revolving at a great speed. By its means either of the fatty substances is thoroughly broken up and embodied in the liquid, producing an article which, for many purposes, is equal to whole milk. The machine is also used to deal with rancid butter, which can be melted down, passed through the emulsor, mixed with skim milk, and then churned in the usual way. By mixing raw margarine with skim milk and churning, butter-margarine is produced. The machine is also used to make whole milk "inseparable"—that is to say, it can be sent by carriage or by rail without the cream separating from the milk.—*British Trade Journal.*



Conducted by PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

THE AUSTRALIAN FOREST QUESTION CONDENSED.

A PROBLEM.

By PHILIP MAC MAHON.

1. The timbers of Australia are the best, the strongest, the most enduring, and the quickest-growing in the world. The experts of every country are agreed on this.

2. They comprise hard, soft, and medium woods, all amongst the best of their class on earth.

3. They can be grown like weeds in their own land, under forest conditions, at trifling cost.

4. Australia claims to have 107,000,000 acres of such woods, nearly all within 100 miles of the ocean.

5. Great Britain takes £25,000,000 worth of timber annually from foreign, possibly hostile, States, and for the past thirty years Secretaries of State for the Colonies have been begging Australian Governments to look after their existing timber supplies with a view to perpetuation.

7. The only State in Australia with a timber export (£500,000 a year) is Western Australia, which gave away its forests to syndicates, who realise their value.

8. No valid reason has ever been advanced why the States cannot manage their forests as well as a syndicate.

9. Australia pays to foreign countries every year for timber the sum of £1,080,000 sterling.

10. Australia has at present unemployed, and in urgent need of the necessaries of life, many thousands of axemen, labourers, sawyers, &c., all able and willing to work.

11. Is it desirable to alter this state of things?

12. Can it be altered?

13. If so—How?

There seems to be room in this problem for the lifework of a great organising statesman. It is not thought beneath the dignity of a Roosevelt in America.

EUCALYPTUS TIMBERS IN SOUTH AFRICA.

By PHILIP MAC MAHON.

For some years past the Government of Cape Colony has kept a close eye on our Australian forests. The Cape must have timber. No timber—no railways; no railways—no progress. They have ever present before them the possibility of the failure of Australian supplies. They are familiar with the fate of the splendid forests of Victoria, which were the only approach on this continent to real forests, as the term is understood in Europe, and their officers are quite familiar with the composition of many of our "alleged forests," to use a rather expressive term coined by the *Sydney Morning Herald*. They have read the recent reports of the Royal Commission on the forestry question in Victoria, and they are not unacquainted with the caustic summing-up of the position by the Premier of Victoria, Mr. Bent, when he publicly declared that Victorian forestry "would make a pig laugh." They know that one of the contractors for a few sleepers (only a drop in the ocean of their wants) was compelled to reduce prices for chopping, and to get freight and royalty concessions in order to supply the sleepers at all. All this has set them thinking, and so they are setting seriously about producing their own gum forests. And as they do so, they have a malediction or two to spare for the shortsighted men who, without the slightest gain to themselves, destroyed the original forests, like the boy in the story, who cut down the cherry-tree to get the fruit. They are going about the matter in the only way that is likely to be crowned by success: the methodical way. The country is divided into three conservancies—eastern, western, and midland. The remnants of the original forests are being brought under sylvicultural conditions, and plantations are being formed everywhere possible. This is expensive, and should never have been required; but, then, forest neglect in a new country is exactly like borrowing money and shovelling it into the sea. The people must pay the bill by and by, in timber import and forest renewal. And it is a bill that must be met at compound interest.

The South Africans wish to make as few mistakes as possible, and so they have established a collection of groups of eucalypts called an "Eucaltum." Here they study the behaviour of our eucalypts, and the following table, which I borrow from the report of the Conservator of the Eastern Conservancy for 1902, is of considerable interest to Australians. The list comprises some of our best known and most valuable ironbarks, stringybarks, bloodwoods, and gums. It will be noted that our blackbutt (*E. pilularis*, a splendid timber) grew at the rate of nearly 9 feet per annum, or 44 feet 4 inches in five years. This was the average of 100 trees.

EUCALYPTUS AVERAGES IN SOUTH AFRICA, 1902.

Tokai Eucaltum.

Age.	Name of Tree.	Average height in feet.	Average diameter to nearest inch.	Maximum diameter in inches.	Maximum height in feet.	Average yearly height growth.	Average yearly diameter growth inches.	Percentage of crooked or forked trees.	Percentage of weak trees.	Number of Trees in Plot.
							Per cent.	Per cent.		
6 years old	Eucalyptus amygdalina (Weeping Peppermint)	34.0	3	$7\frac{2}{3}$	53	5.66	0.52	11	3	99
	Eucalyptus microcorys ...	30.5	3	$7\frac{1}{3}$	49	5.08	0.57	1	Nil	100
	,, obliqua ...	30.5	4	$9\frac{1}{3}$	45	5.08	0.72	8	7	331
	,, cornuta ...	34.3	3	5	42	5.71	0.51	80	Nil	40
	,, calophylla ...	24.4	3	7	38	4.06	0.5	15	8	184
5 years old	,, alpina... ...	29.1	3	7	58	5.82	0.67	Nil	Nil	28
	,, stuartiana ...	30.9	4	11	57	6.18	0.92	,,	,,	27
	,, pilularis ...	44.3	6	$8\frac{2}{3}$	55	8.86	1.13	3	,,	100
	,, viminalis ..	30.9	3	7	52	6.18	0.68	10	$7\frac{1}{2}$	40

EUCALYPTUS AVERAGES IN SOUTH AFRICA, 1902—*continued.*

Age.	Name of Tree.	Average height in feet.	Average diameter to nearest inch.	Maximum diameter in inches.	Maximum height in feet.	Average yearly height growth.	Average yearly diameter growth inches.	Percentage of crooked or forked trees.	Percentage of weak trees.	Number of Trees in Plot.
							Per cent.	Per cent.		
5 years old	Eucalyptus diversicolor ..	28.8	3	7	50	5.76	0.79	Nil	Nil	36
	„ amygdalina, N	29.3	4	8⅔	47	5.86	0.74	10	„	36
	„ robusta ...	32.7	4	7⅔	45	6.54	0.77	7½	„	40
	„ leucoxylon ...	32.2	3	6	45	6.44	0.69	30	1	100
	„ gunnii ...	30.3	4	8⅓	45	6.06	0.81	14	11	36
	„ globulus ...	24.8	2	5	45	4.96	0.46	0½	28	67
	„ corynocalyx, N	30.3	4	6⅔	43	6.06	0.75	Nil	Nil	36
	„ sieberiana ...	32.0	4	6⅔	43	6.4	0.81	„	„	25
	„ piperita ...	31.1	4	7	42	6.22	0.75	12½	12½	40
	„ longifolia ...	27.7	3	6	42	5.54	0.58	Nil	13	39
	„ rostrata ...	24.3	3	5	38	4.86	0.71	„	Nil	10
	„ citriodora ...	22.3	2	5	38	4.46	0.52	6	„	100
	„ leucoxylon ...	22.2	2	4	38	4.44	0.43	19½	10	31
	„ sideroxylon ...	27.4	3	5⅓	36	5.48	0.67	Nil	Nil	36
	„ amygdalina, W	23.3	3	5	33	4.66	0.54	„	„	39
	„ marginata ...	20.8	3	6⅓	31	4.16	0.67	45½	„	199
	„ polyanthema ...	7.7	9	12⅔	14	1.54	1.78	24	8	51
3 years old	„ amygdalina, S	19.5	2	4	33	6.5	0.66	7¾	7¾	30
	„ globulus ...	20.6	2	3⅔	31	6.87	0.68	3½	3½	28
	„ tereticornis ...	19.3	2	3	30	6.43	0 59	Nil	Nil	39
	„ corynocalyx, S	19.8	2	3⅓	27	6.6	0.63	9	„	35
	„ resinifera ...	17.3	2	2⅔	23	5.76	0.64	6	„	35
	„ coriacea ...	16.5	2	2⅔	22	5.5	0.62	Nil	„	39
	„ melliodora ...	13.4	1	2	21	4.47	0.47	18	2½	38
	„ gomphocephala	16.1	2	2⅔	20	5·37	0.63	79	5	19
	„ amygdalina, S (broad leaved)	12.0	1	2⅓	18	4.0	0.15	21	Nil	33

TREE-PLANTING.

By PHILIP MAC MAHON.

States generally take to tree-planting some time before they begin the practice of forestry. The settlers in the country look upon trees as an unmitigated evil, and with fire and axe destroy them. When they are cut down to satisfy the legitimate demands of industry or export, only one class of person has to do with them as a rule—that is, the person charged with the collection of the wood harvest. The scientific forester is seldom called in until things are in a pretty bad way. And then, curiously enough, it is the people of the towns who get alarmed. And they generally go to the other extreme. Much of their anxiety is blended with a certain sentimental interest of the "Woodman, Spare That Tree" order. Often, of course, forests have to be planted in countries and parts of countries where the possibilities of natural regeneration have not been grasped soon enough. And it is so easy to let the time slip past. It seems only the other day that New Zealand was talking about her "inexhaustible forests, enough to supply the demands of the world." Now she is planting for dear life, and planting eucalypts, too.

In New Zealand they still plant in pits. One of the plantations best known to Australian visitors is that near Rotorua, at Whakarewarewa. Here the pits cost 17s. 6d. per 1,000 to prepare, and the planting costs 10s. per 1,000, with an additional charge of 2s. 6d. per 1,000 for carting the transplants. Thus the planting costs £1 10s. per 1,000 trees. For the clearing of the land, preparing pits, and planting trees, there have been paid the following prices within the past three years:—Mainototo, £2 9s. 10d.; Rotorua, £2 18s. 6d.; Tapanui,

£3 11s. 6d. The percentage of loss is from $1\frac{1}{2}$ to 3 per cent., and these are quickly made good.

In France, where pitting is often practised, the pits are made at 4s. per 1,000, and the planting is done at 3s. per 1,000. Plants are raised in home nurseries at 3s. per 1,000, but, if they are purchased, they cost up to 12s. per 1,000.

In Victoria very large sums have been expended in the planting of trees. Some of these were Australian, and some exotic. The Monterey Pine has been most extensively planted. Why it should have been chosen as a timber tree is a puzzle. Its timber is comparatively worthless, as has been well known to foresters for a great many years past. Baron von Mueller warned the authorities, long before it was extensively planted, that its timber was of inferior technic value. At the forest plantation on the You Yangs, not far from Geelong, there are about 900 acres of plantations, consisting of blue gums, sugar gums, red gums, pines, oaks, elms, and wattles. At Creswick between 400 and 500 acres have been planted with various pines, eucalypts, sycamores, cedars, and planes. There are two or three minor plantations. It seems quite impossible to arrive at a reliable estimate of what the cost per acre of these plantations has been. The matter is mixed up with many other accounts in all the published reports available, but in one of his earlier annual reports Mr. Perrin, Conservator of Forests in Victoria, estimated that a man would plant 2,000 eucalypts per day.

The planter *par excellence* is the Scotch under forester. I have known an exceptionally good man, using the planting iron, to plant as many as 5,000 young trees in one day. Of course he did not pit them. As a matter of fact, pitting trees is of dubious advantage, and is often a positive injury to the young trees, apart from its expense, but, as Kipling says, "that is another story." In Aberdeenshire during the past sixty years a great deal of planting has been done, and we will let one of the veterans of the game tell his own story. Mr. T. Milne, Forest Nurseryman, Aberdeen, said to the Forestry Congress in Edinburgh, exactly twenty years ago:—"During the past forty years I have had charge of planting about 10,000 acres of waste land, both moor and mountain, chiefly in Aberdeenshire, and of the 30,000,000 trees required for that area about 6,000,000 were planted by my own hands. An experienced workman, on good ground, can plant from 400 to 500 seedlings per hour, or from 1 to $1\frac{1}{2}$ acres per day. I visited a hill on the estate of Balfour a few months ago, which I planted in 1842, and the forester considered that a good many of the larches there were worth over £1 each, and other plantations have succeeded equally well."

Mr. Grant Thomson, head forester to the Countess Seafield, of Strathspey, gave evidence before the Select Committee on Forestry in 1887, that the cost of planting 900 acres was as follows:—

	£	s.	d.
Fencing	259	10	2
Three million plants—nursery cost	651	6	0
Carting and planting...	328	19	1
Drains	64	8	4
	£1,304	3	7

Or about 28s. per acre, or 9s. per 1,000 plants for all expenses, or 2s. 2d. per 1,000 for carting and planting.

The head forester to the Duke of Athol estimated that moorland worth
The head forester to the Duke of Athol estimated that moorland worth 6d. per acre per annum could be prepared, fenced, and planted at £2 per acre, it being understood that in no country where forestry is now practised as a business 5,000 plants to the acre. Indeed, Sir Herbert Chermside is now planting on his English estates at this rate.

Eighty years ago, about 1,500 plants were planted to the acre, at a cost of about 1s. 6d. per 1,000 for planting only. The movement in favour of much closer planting, which originated in Germany, has, since then, made great headway in Scotland, and has been found to be the better method of forest culture.

I should like to quote in this connection a short extract from a report by Dr. Adam Schwappach, Professor of Forestry in the Prussian Forest School of Eberswald, and Director of Prussian Forestry Investigation. He found "the most scientific system of forestry, according to German notions, in the large pine woods belonging to the Countess of Seafield, in the neighbourhood of Grantown. . . . At Curr Hill it was an interesting experience for me to find a wood, about twenty years old and about 100 acres in extent, which had been regenerated naturally, and which was showing a density and uniformity which, without artificial assistance, could not have been obtained in Germany, where the young trees suffer much during the felling of the shade trees." This quotation brings us very forcibly back to the hypothesis with which I started, that nations usually start tree-planting before they begin to practise forestry.

The figures which we have casually glanced at serve, I think, to indicate that in a country such as Scotland—where moorland is cheap, at the outside 1s. 6d. per annum at twenty-five years' purchase—where a market is assured for all forest produce, from the first thinnings to the mature timber—it is necessary to plant at an exceedingly cheap rate, and with swiftness, system, and efficiency, to make an interest on the investment of money which will be equal to investment in consols. But, as Dr. Schwappach says: "Apart from the increase of revenue [and he shows that systematic management would double the present revenue of Scotch moorland, at present value 1s. 6d. per acre], the afforestation of land is of great national importance as a labour-employing industry. Land under wood can maintain a larger population than land under rough pasture. From the national point of view, it is manifestly an advantage to obtain timber at home, and so dispense with its importation from abroad. This matter is of greater special importance in view of the fact that many countries which at present export timber must, in the near future, cease to do so."

Of the enormous area of territory under the control of the Forest Department in India, only about 180 square miles, equal to a block $13\frac{1}{2}$ miles square, has been put under artificial plantations. The late Inspector-General, Mr. B. Ribbentrop, says: "Here, in India, it is necessary to rely almost entirely on the natural reproduction of our forests. For a more intensive management, the areas to be treated are by far too vast, and the average cash revenue per acre is too insignificant."

On a totally different plane as regards cost is the question of experimental plantations. Perhaps it would be only fair to regard all the planting operations which have hitherto taken place in Australia as being of an experimental nature.

Experiments are always interesting, and often costly. The man who experimented in making himself a suit was heard to remark, when he had used up his cloth, that he wished he had employed a tailor.

In the years 1884 to 1888, about 23,000 cedar-trees, varying from 2 to 4 feet in height, were transplanted by the New South Wales Government from parts of the Don Dorrigo Scrub and Hogan's Brush (where they were found growing naturally) into other parts of the same scrubs from which the cedar had been denuded. In 1890, six years later, Mr. J. Ednie Brown, then newly appointed Director of Forests, inspected these plants, and reported that only from 5,000 to 6,000 of these were alive, and that they were stunted in growth.

Mr. Ednie Brown then carried out experiments in the same direction, which he records as follows:—"From November, 1890, to the end of September, 1891, the work performed consisted of clearing all vines and undergrowth around 7,693 young cedar plants, while 823 self-grown young trees were transplanted

to favourable localities. The total cost amounted to £859 5s., and the area operated upon was about 1,500 acres, and the cost per plant was about 2s. each." Coghlan's record, ten years later, on this experiment is instructive. It reads:—"At Don Dorrigo, some years ago, spaces were cleared around the young cedar-trees for the purpose of admitting light and air; but the experiment was not successful, the young trees growing in their natural state in an adjoining position proving the better by comparison." The lesson of all of which is, Let us use our forests wisely, and, while we use them, provide that they may reproduce themselves for our children. We have much to learn about our forests. Ribbentrop says of his life-work: "The science of the correct treatment of all classes of Indian forests is as yet in its infancy, and its study, I must say, looking back on the number of years I have been in India, of which a considerable portion has been spent within its forests, seems almost interminable." Let us hope that the Federal Government may find itself able to take some practical steps towards the encouragement of a systematic study of our Australian woodlands—an enormous and admittedly much-neglected source of national wealth.

Times of Sunrise and Sunset, 1904.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5 51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·12
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·41
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

PHASES OF THE MOON.

			H.	M.	
3 Sept.	☽	Last Quarter	9	58	p.m.
10 „	●	New Moon	6	42	a.m.
17 „	☾	First Quarter	1	12	„
25 „	○	Full Moon	3	49	„
2 Oct.	☽	Last Quarter	11	52	p.m.
9 „	●	New Moon	3	24	„
16 „	☾	First Quarter	3	54	„
24 „	○	Full Moon	8	55	„
1 Nov.	☽	Last Quarter	9	13	a.m.
8 „	●	New Moon	1	36	„
15 „	☾	First Quarter	10	35	„
23 „	○	Full Moon	1	11	p.m.
30 „	☽	Last Quarter	5	38	„
7 Dec.	●	New Moon	1	46	p.m.
15 „	☾	First Quarter	8	6	a.m.
23 „	○	Full Moon	4	1	„
30 „	☽	Last Quarter	1	46	„

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1904.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
„ 23 to 30	10 m.	10 m.	28 m.	26 m.	32 m.	30 m.
October ...	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m.	40 m.	14 m.	50 m.	12 m.
December ...	8 m.	2 m.	44 m.	10 m.	55 m.	7 m.

Entomology.

LANTANA INSECTS.

The rapid spread of the lantana in many districts of Queensland is having the effect of throwing valuable agricultural lands out of cultivation, and thousands of acres of grass lands are now so overrun by the pest that they have become useless as grazing lands. Where the lantana has been growing in dense masses for any length of time, the soil is greatly enriched by the falling leaves, blossoms, and berries, the whole surface being covered with a rich humus. But the clearing is a troublesome business, and farmers prefer utilising poorer land to undertaking the labour of ridding it of lantana.

There are, however, certain insects in Mexico which destroy the leaves and flowers of the plant to such a degree that it can no longer spread, and their introduction into Hawaii, where the lantana appears to be as great a nuisance as in Queensland, has been adopted.

From the *Hawaiian Forester* we glean the following particulars concerning some of these insects, which were described by Mr. R. C. L. Perkins, Assistant Superintendent of the Division of Entomology of the United States Department of Agriculture, in a paper read before the Hawaiian Live Stock Breeders' Association. Mr. Perkins said:—

In order to bring up to date the account of the insects that were imported from Mexico to check the growth or spread of lantana, I have drawn up these brief additional notes. My earlier reports on these insects have already been published in past numbers of the *Planters' Monthly*.

Excluding those species of which only a single mature specimen was obtained alive at any one time, and which consequently could not become established in the island, I find that Mr. Koebele supplied me with the following number of species:—

Butterflies and moths	14
Beetles	2
Bugs	1
Flies	2
Total	19

In addition to these, at least ten other species were sent over from Mexico, either for immediate introduction or for experimenting on with a view to introduction, if this were safe. All these, however, failed to survive the long journey or died from the attacks of parasites and fungus diseases with which they were affected. All the difficulties encountered in importing the lantana insects from Mexico to the islands have been fully discussed in my earlier papers, and need not be referred to again on this occasion.

Butterflies and Moths.

To return to the seventeen imported species, of which adults were obtained alive, I find that, of the fourteen butterflies and moths, three species were destroyed by me as being decidedly dangerous to other vegetation; two others were not liberated because they were liable to become injurious; and one, of which only a solitary pair were obtained, failed to breed. Subtracting all these, eight species of butterflies and moths were liberated in numbers sufficient to render their establishment possible. Three of these species soon showed up in large numbers—some four months after they were liberated; two others were not seen at all until nine months after they had been turned loose, but are both now in very large numbers and rapidly extending their range; while of the three others, two at least will probably prove to have established themselves, and the remaining one to have died out.

Beetles and Flies.

Of the two beetles neither has been seen at present, but one of these was hardly likely to increase sufficiently to become noticeable under two years;

and the other, since we considered it of minor importance in its effect on lantana, has not been looked for in the spots where it was liberated.

Of the two species of flies the success of the one was instant and phenomenal; the second was also quite successfully established, but is of comparatively small economic value.

The solitary species of true bug, of which only half a dozen sickly individuals reached here, is now firmly established. Its effectiveness is not yet fully ascertained, since it has natural enemies, in the shape of certain other bugs, which have been present in the islands for many years.

As to the

OTHER IMPORTANT LANTANA INSECTS,

they are at present practically free from attacks from other predaceous or parasitic insects; and it is quite certain that the parasites, which in Mexico destroy at least 90 per cent. of the individuals of the lantana-eating species, were entirely eliminated here, before the latter were liberated. To this fact is due the astonishing rapidity of increase of some of the quicker-breeding insects in these islands, so that after three months, from two or three dozen of the berry-eating fly, originally liberated, the progeny had already run into many millions.

THE LANTANA CHECKED, BUT NOT DESTROYED.

The imported insects enumerated above are almost all feeders on the seed, unripe berry, flower, bud, or shoot. These do not in any way destroy the bush itself, but they are highly effective in checking any further spread of the plant, and render it possible for any one to clear lantana-covered land once and for all, without fear of having to perform this work at intervals of every few years. Amongst these, however, are a few which have a more serious effect on the health of the plant. One of the two imported beetles lives as a larva in the tap root, and if it proves to be established, and becomes numerous, it will probably destroy many bushes. The true bug, that I have specially mentioned above, is extremely injurious to lantana, and, in localities where it thrives best, is quite capable of entirely killing a bush. Its effectiveness will probably vary much, according to the nature of the locality, and also on the number of the predacious insects that, as I have mentioned, already attack it.

SHOULD LANTANA BE DESTROYED?

This finally brings up the question whether lantana should be, if possible, entirely destroyed. Most owners of lantana-covered ranches will have but one answer. Many persons, however, who are interested in forestry and agriculture, are opposed to any such total destruction. The question appears to me one to be decided only by an expert forester, not on superficial examination, but only after having spent at least many months in fully examining all the conditions here.

The insects that have now been imported are, I believe, sufficient to fully check any further spread of the pest, but insufficient for its destruction. That total destruction could be effected by importation of other insects can hardly be doubted, but so much care would be necessary, that it would certainly require the individual attention of several entomologists for at least two seasons to complete the work. It must be remembered that in the work already accomplished only those insects which appeared safest to introduce were handled, and even of these some were discarded as dangerous. Other species would require the most careful and prolonged experimenting with before they could be liberated.

SEED-DESTROYING INSECTS.

As to the results obtained from the seed-destroying species distributed throughout the islands, I cannot personally supply much information. Although scores of parcels of the insects have been distributed, only four or five of those interested have reported results. I can only say that in the immediate neighbourhood of Honolulu, where I distributed the insects myself, complete success was rapidly attained. Throughout the length of the Pacific

Heights car-line it is hardly possible to obtain a good seed, and in many places the insects are actually starving from their excessive numbers. Frequently some solitary flower on a bush contains several eggs of one or other insect, though it is quite insufficient alone to bring to maturity even one of these.

The small seed-eating fly flourishes as high as 2,000 feet in the mountains, and has been reported to me as having reached 2,500 feet. I have no doubt some of the other insects will extend to greater elevation still, or at least as high as the extreme range of the lantana itself. No doubt members of the association can supply full information on the spread and effect of the lantana insects in many districts of the islands. Such information is much needed by me, as it is the intention of the entomological division of the Board of Agriculture to prepare a bulletin giving a full account of the work that has been accomplished.

To show

THE COMPLICATED NATURE OF THE PROBLEM

that presented itself to Mr. Koebele when he was at work in Mexico, I may mention that the collection of insects made by him from lantana in that country amounted to nearly 400 distinct species, and to these must be added about 100 more, chiefly very minute parasites, bred by me here from material forwarded from Mexico. A large number of these species I have brought with me for inspection by those interested.

A QUEENSLAND STUDENT AT A SCOTCH UNIVERSITY.

On the 18th June last, about eighty students of the Edinburgh University were invited by Professor Cossar Ewart to pay a visit to the Natural History Experimental Station at Penicuik. Here they were shown, on the moor above Pomathorn, the wild horse recently brought from Central Asia. The *Peeblesshire Advertiser*, in a notice of the visit, says:—"They also saw two Kiang hybrids, bred last year, the characteristics of which go to prove that what is scientifically known as the 'wild horse' is indeed what its name implies, and not a mule. The appearance of the Asiatic tarpan, or wild horse, greatly interested the students, the interest being intensified as the professor pointed out the characteristics which distinguished it from all other feral tribes—the hog mane, the mule-like tail, and 'chestnuts' on its hind legs. Leaving the moor, the party proceeded to the Bungalow, as also to a park within the policies of Penicuik House. At the former paddock they had an opportunity of seeing a second kind of horse—the Norse type—which is characterised by stripes on the legs and face and body, as well as a great band down the back. A fine specimen of this horse was recently received from West Ross-shire. A third type, and another perfectly distinct horse, was also seen in the form of an Iceland pony, with its heavy mane and long tail—in several characteristics like the zebra. This is the pony that has been named the Celtic pony, and which is especially found in the outer islands. Very much interest was also shown in a cream-coloured half Arab foal, two days old, the mother of it being a handsome Connemara pony. Ponies from Java, Faro Isles, and Iceland, the Hebrides, half Arabs, Shetland oxen, Jersey bull, St. Kilda sheep, rabbits from the Himalayas, and rock pigeons, were seen, and many interesting facts were stated regarding their relation to the Darwinian theory of reversion. On the invitation of the professor, Mr. Rahman, a native of India, gave an account of the measures taken by Government to encourage the breeding of horses in the Punjab States, whilst another student—the son of a Queensland stock farmer—delighted his comrades by mounting one of the 'wild horses' and riding across the park without the aid of a saddle or reins."

We have not been able to ascertain the name of this plucky young Queenslander, but it is satisfactory to know that a residence in a Scottish University has not deteriorated his horsemanship.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1903.						1904.						
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.
North.													
Bowen	0·31	0·22	0·51	1·36	3·14	6·13	3·45	2·65	1·12	0·31	0·25	0·30	Nil
Cairns	0·87	0·44	0·47	0·91	3·10	13·51	10·03	10·55	15·73	13·33	3·21	Nil	0·35
Geraldton	2·07	7·08	3·79	3·05	7·13	37·86	24·37	14·04	31·09	38·73	11·81	0·39	1·78
Herberton	0·19	0·33	Nil	0·67	6·21	15·52	8·01	5·16	18·25	7·08	1·55	Nil	Nil
Hughenden	0·07	0·31	0·65	0·80	2·36	5·30	2·71	2·80	1·93	1·36	0·07	0·44	Nil
Kamerunga	1·10	1·50	0·86	1·39	4·94	14 33	7·37	9·39	22·35	15·48	3·50	Nil	0·42
Longreach	0·69	Nil	1·58	0·90	0·83	1·76	1·77	2·69	1·01	0·31	2·78	0·04	Nil
Lucinda	2·38	4·39	0·30	0·76	10·67	40·34	11·71	8·40	22·40	11·30	4·00	Nil	0·45
Mackay	2·53	0·59	0·44	1·54	9·86	5·52	16·74	3·17	5·69	5·24	3·61	0·93	0·12
Rockhampton	3·73	0·68	0·54	1·84	7·42	4·08	5·12	3·50	5·11	13·82	0·77	1·26	0·03
Townsville	0·05	0·19	0·44	2 42	5·97	19·02*	5·48	5·19	4·01	1·03	0·24	0·04	Nil
South.													
Barcaldine	0·99	0·50	4·23	1·01	4·00	0·92	3·26	0·96	0·11	1·19	3·85	0·16	Nil
Beenleigh	5·04	2·26	4·13	3·29	4·78	1·60	2·81	1·25	8·06	14·99	6·17	0·15	1·54
Biggenden	3·90	1·62	2·23	2·77	4·37	5·62	7·48	0·71	3·16	2·92	2·29	0·71	0·29
Blackall	1·81	0·75	2·25	0·45	2·56	1·79	2·28	3·67	0·39	3·76	3·08	0·32	0·12
Brisbane	5·56	3·84	4·73	3 65	3·98	2·19	2·65	0·77	7·07	7·23	4·04	0·59	1·48
Bundaberg	5·98	0·88	3·55	0·43	3·25	9·97	3·18	0·85	4·26	5·64	1·32	0·86	0·51
Caboolture	6·08	3·27	4·41	3·11	9·98	4·18	4·29	1·32	8·48	9·90	4·66	0·17	2·12
Charleville	1·61	0·62	3·49	0·95	2·20	2·98	1·87	2·56	4·60	3·62	3·07	0·31	0·52
Dalby	3·78	2·30	3·30	3·12	6·30	1·19	1·88	3·20	4·74	0·40	4·69	0·34	2·63
Emerald	0·57	0·24	1·28	1·90	2·21	4·30	2·70	1·26	4·14	5·88	1·23	0·96	0·06
Esk	2·97	4·21	4·86	3·69	4·02	1·43	2·37	1·86	3·18	4·91	3·99	0·20	2·43
Gatton College ...	4·15	2·50	3·56	4·71	5·05	1·04	2·15	1·20	4·17	2·59	3·79	0·45	2·12
Gayndah	2·81	1·06	2·62	4·37	3·03	5·12	7·01	1·83	2·97	1·63	1·61	0·93	0·99
Gindie	0·51	0·30	1·58	1·97	4·06	4·26	1·52	1·40	1·83	4·81	1·65	0·43	Nil
Goondiwindi	4·38	2·09	4·22	2·16	3·73	3·62	2 90	2·65	7·32	0·37	3·40	0·49	2·62
Gympie	1·67	2·72	2·42	5·61	4·50	4·88	9·27	1·80	3·32	10·86	4·11	0·60	1·11
Ipswich	3·64	2·70	5·24	2·98	3·84	1·01	4·07	1·72	3·55	4·71	3·50	0·23	1·75
Laidley	4·65	3·06	4·25	5·47	3·87	1·82	2·93	1·35	5·36	2·83	3·12	0·32	1·68
Maryborough	6·17	1·09	1·93	2 62	3·96	5·04	2·64	0·56	3·94	10·07	4·42	1·37	0·39
Nambour	5·38	3·95	3·60	3·85	6·13	2·43	6·39	1·91	10·30	15·43	6·94	0·32	1·78
Nerang	7·34	2·21	3·81	3·52	3·86	4·24	3·89	0·85	11·18	13·83	7·52	0·19	1·12
Roma	2·26	1·13	6·61	1·92	3·16	4·21	1·85	0·59	2·32	5·06	3·73	0·20	0·84
Stanthorpe	4·71	1·98	6·07	3·45	4·45	2·59	2·29	1·33	6·57	0·71	4·11	0·63	2·64
Tambo	2·64	0·27	4·33	1·08	3·17	2·91	2·48	1·72	1·26	5·46	3 96	0·28	0·61
Taroom	3·83	2·21	1·51	2·05	3·76	3·22	1·39	2·79	1·68	2·21	3·49	0·54	0·59
Tewantin	7·09	5·70	5·80	2·85	9·85	1·37	3·03	2·59	19·55	30·39	9·20	0·21	1·11
Texas	4 53	3·21	1·55	2·47	4·93	4·44	1·70	3·67	5·72	0·03	2·99	0·70	2·12
Toowoomba	3·90	3·00	4·06	3·82	4·85	4·27	4·26	3·98	4·76	3·29	4·08	0·38	2·58
Warwick	5·45	2·63	3·41	2·89	3·92	2·73	0·60	2·91	5·74	0·66	2·85	0·53	1·98
Westbrook	3·89	1·63	3·89	4·03	5·11	3·75	1·46	2·82	3·49	9·00	3·18	0·22	2·24

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian, average, 84s. to 88s.; Danish, 100s. to 112s.; New Zealand, 98s. to 100s.; Queensland, 82s. to 86s.; Canadian, 82s. to 88s. per cwt.

CHEESE.—Canadian, 38s. to 51s.; New Zealand, 38s. to 56s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £16 to £18; raw, £15 to £16 6s. per ton; German beet, 88 per cent., 9s. 4½d. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—4s. to 8s. 6d. per cwt.

RICE.—Rangoon, £8 7s. to £12 10s.; Japan, £13 to £17 10s.; Java, £17 to £21; Patna, £15 to £18 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 44s. to 130s.; peaberry, 60s. to 120s.; Santos, 30s. to 46s.; Mocha, 55s. to 90s.; Jamaica, 48s. to 125s. per cwt.

CHICORY ROOT, dried (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 1⅝d. to 3½d.; Natal, 5¾d. to 7d.; Bermuda, 1s. 2d. to 1s. 5d. per lb.

WHEAT.—Duluth, 30s. to 31s. per 496 lb.; English, 28s. to 29s. per 504 lb.; Australian, 32s. 7½d. to 32s. 9d. per 480 lb. = about 4s. 1d. to 4s. 1⅛d. per bushel.

FLOUR.—27s. to 31s. per 280 lb.

MALTING BARLEY.—30s. to 32s. per 448 lb.; grinding, 36s. to 40s. per 416 lb.

OATS.—New Zealand, 22s. to 24s. per 384 lb.

SPLIT PEAS.—38s. to 48s. per 504 lb.

GINGER.—Jamaica, 30s. to 60s.; Cochin, 26s. to 60s.; Japan, 17s. to 18s. per cwt.

VANILLA.—3s. to 7s. per lb.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 45s. to 50s. per cwt.; black, 5d. to 5⅛d.; white, 7⅞d. to 8d. per lb.

GREEN FRUIT.—Apples: American, 12s. to 15s.; Australian (average), 9s. to 12s.; Tasmanian, 9s. to 12s.; South Australian, 9s. to 12s. per case; bananas, 7s. to 11s. per bunch; pineapples, 2s. 9d. to 5s. 6d. each; oranges, Valencia, per 420, common, 15s. to 17s.; medium, 19s. to 20s.; fine selected, 22s. to 26s.; finest selected, 22s. to 26s.; lemons, Messina, per 360, ordinary to fine, 6s. to 9s.; grapes, West Australian, a trial shipment proved a comparative failure; price realised, 2d. per lb.

DATES.—Tafilat, none; Egyptian, none; Persian, 63s. to 100s. per case.

COTTON.—Uplands, 7d. to 8½d.; Sea Island, 1s. 2d. to 1s. 8d. per lb.

COTTON SEED.—£5 10s. to £5 15s. per ton.

COTTON-SEED OIL.—Crude, £17; refined, £18 5s. to £19 10s. per ton.

COTTON-SEED OIL CAKE.—£6 11s. 3d. to £7 5s. per ton.

COTTON WASTE.—In 5-cwt. bag bales, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—33s. to 44s. per 416 lb.

LINSEED OIL.—£6 5s. to £6 15s. per ton.

LINSEED OIL CAKE.—£5 15s. to £6 5s. per ton.

OLIVE OIL.—£30 to £55 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 5s. to £16 10s. per ton; £8 to £9 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£28 to £31 per ton.

BEESWAX.—Australian, £7 2s. 6d. to £7 5s. per cwt.

LUCERNE SEED.—60s. to 70s. per cwt.

CANARY SEED.—72s. to 90s. per quarter of 480 lb. = 9s. to 11s. 3d. per bushel.

MANILLA HEMP.—£30 to £35 per ton.

SISAL HEMP.—£35 per ton. During the year sales in New York of Mexican sisal were effected at £37 2s. 6d. and £40 6s. 8d. per ton.

NEW ZEALAND HEMP.—£29 5s. per ton.

FLAX.—£48 to £52 per ton.

TAPIOCA (duty, 5d. per cwt.).—2¾d. to 5d. per lb.; pearl, 11s. to 15s. 6d. per cwt.

EGGS.—French, 9s. 6d. to 10s. 6d.; Danish, 6s. to 8s. 9d. per 120.

BACON.—Irish, 52s. to 60s.; American, 39s. to 42s.; Canadian, 38s. to 45s. per cwt.

HAMS.—Irish, 76s. to 92s.; American, 50s. to 56s. per cwt.

TALLOW.—Mutton, fine, 26s. 9d.; medium, 24s. 9d.; beef, fine, 26s.; medium, 24s. per cwt.

GOATSKINS.—Cape, from extra light to heavy, 9d. to 15½d.; Angora, light to heavy, 5d. to 7½d.; Natal, goat and Angora, 1¾d. to 8d. per lb.

POULTRY (Smithfield).—Yorkshire, 2s. 9d. to 3s. 3d.; Essex, 3s to 3s. 6d.; Boston, 2s. 6d. to 3s.; Surrey, 3s. 6d. to 4s. 6d.; Sussex, 3s. 6d. to 4s.; Welsh, 2s. 6d. to 2s. 9d.; Irish, 2s. to 2s. 6d.; goslings, 4s. 3d. to 5s. 6d.; country ducklings, 2s. 9d. to 3s.; Aylesbury ducklings, 2s. 6d. to 3s.; wild rabbits, Australian, 6s. 6d. to 8s. 6d. per dozen.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Aug. 6.	Aug. 13.
New Zealand Sheep. (Crossbred Wethers and Maiden Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Dunedin and Southland (56 lb. to 64 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
North Island (56 lb. to 65 lb.), ordinary	$3\frac{15}{16}$d.	$3\frac{15}{16}$d.
North Island, best	$4\frac{1}{16}$d.	$4\frac{1}{16}$d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	None offering.	
Light (under 50 lb.)	None offering.	
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
Light (under 50 lb.)	$3\frac{11}{16}$d.	$3\frac{11}{16}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36lb.), new season's	$5\frac{15}{16}$d.	$5\frac{7}{8}$d.
Canterbury, heavy (36lb. to 42lb.), new season's	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{3}{4}$d.	$5\frac{11}{16}$d.
North Island (28 lb. to 42 lb) ...	$5\frac{11}{16}$d.	$5\frac{5}{8}$d.
Australian Lambs.		
30 lb. to 40 lb.	None offering.	
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$3\frac{1}{4}$d.	$3\frac{1}{8}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$5\frac{1}{2}$d.	5d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	$2\frac{3}{4}$d.	$2\frac{3}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$4\frac{1}{4}$d.	4d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	3d.	$2\frac{3}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$4\frac{7}{8}$d.	$4\frac{1}{4}$d.

QUEENSLAND CEDAR.—Selectors in the North who have marketable cedar on their land should note that Queensland cedar is quoted in the home market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is practically no demand.

General Notes.

THE AGE OF EGGS.

An ingenious method for determining the age of eggs has been awarded a medal by the National Society of Poultry Breeders of Saxony. It is well known that the air cavity at the blunt end of the egg enlarges as the age of the egg increases; consequently, if an egg be placed in a 1 : 2 solution of common salt, it will have an increasing tendency to float with the long axis vertical. A scale of angles is placed at the back of the salt bath, and, from the inclination of the egg to the horizontal, the age can be gauged almost to a day. A new-laid egg lies horizontally on the bottom of the vessel; when three to five days old the blunt end is raised, so that its long axis makes an angle of about 20 degrees with the horizontal; at eight days this increases to 45 degrees; in fourteen days to 60 degrees; and in three weeks to about 75 degrees; while in a month it stands upright on the pointed end.—*Scientific American.*

THE USE OF JERINGU *(ACORUS CALAMUS)* AGAINST TERMITES.

Mr. Machado lately sent some rhizomes of the Jeringu or Deringu *(Acorus calamus)*, a plant often cultivated by the Malays for medicine. It is one of the Aroideæ, an aquatic plant with sword-like leaves about 3 feet tall, and an aromatic creeping stem. This is being used by the Malays as follows:—The dried roots are pounded to powder and spread round the base of the tree. All ants die, and the others do not appear to come up to the surface to replace them, as in the case of other insecticides. Mr. Machado tried it for ten days and found it efficacious. The plant is so common and so easily grown in any wet ditch that it may be well worth experimenting with it.

The above appeared in the *Agricultural Bulletin* of the Straits and Federated Malay States. Mr. J. F. Bailey, Assistant Colonial Botanist, says that the Aroids all grow well in Queensland. This one might be introduced with advantage.

TERMITES AND RUBBER.

The same journal has the following on white ants damaging rubber-trees:—

Mr. Freudweher, of Bila, Sumatra, has been visiting the gardens and native States, and reports that he has had some trouble with termites, which he has been treating successfully with corrosive sublimate, a solution of which in water is poured over the trunk of the tree after removing the mud casing thrown up by the termites and, a hole being dug at the base of the tree, the liquid is poured in and causes the death of the pests.

He mentions a curious case of damage to a tree by the termites. The tree was about 6 inches through, and was tunnelled out by the termites for about 6 feet, so that it was quite a hollow shell. It was, however, still alive, and produced plenty of latex, and seemed quite unhurt. However, a gale of wind twisted it round and upset it, and on being cut up 2 lb. of rubber was found in the hollow interior. The termites, in trying to bore their way to the outside, had tapped the bark from the inside, and produced a flow of latex into the hollow trunk. The rubber was, of course, very dirty, mixed with débris of all kinds.

SISAL HEMP.

The *Journal d'Agriculture Tropicale* says that all the sisal hemp produced is absorbed by manufacturers in the United States, who pay higher prices than are paid in Europe for the fibre. Latest quotations are 90 francs per 100 kilogs, which is about equal to £37 6s. 8d. per ton of 2,240 lb.

STORING ORANGES.

An American paper says that oranges kept in sand for two or three months keep their flavour and sweetness, and are, to all appearances, perfectly preserved. Samples taken from the groves of the Travellers' Life and Fire Insurance Company, at Grand Island, Florida, were tested by representatives of the paper, and were found to be quite fresh. Will some of our orange-growers try an experiment?

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

TO ESTIMATE THE HORSE-POWER OF A STEAM-ENGINE.

AMATEUR, Burdekin.—

The *Scientific American* gives the following rules as laid down by a practical engineer for a high-pressure or non-condensing engine:—

Square the diameter of the cylinder (piston) in inches, multiply the product by 0.7854, multiply this product by the average pressure of steam per square inch on the piston, and multiply this result by the number of feet the piston travels per minute; divide this final product by 33,000, the quotient will be the *actual* horse-power.

As much of this *actual* power is expended in overcoming the friction and other resistances in the engine itself, deduct from the actual power above obtained 20 per cent. allowance for these resistances and losses within the engine, and the remainder is the available power. Of low-pressure or condensing engines: Follow the above rule, but to get the average pressure on the piston add to the pressure indicated by the steam-gauge or safety-valve the pressure of the atmosphere—viz., 14.75 lb. per square inch (before calculating the average pressure from expansion)—to get the total *initial* pressure, and deduct from the result, say, 2½ lb. or 3 lb. per square inch for imperfect vacuum; and from the final result deduct 25 per cent. instead of 20 per cent. (on account of the resistance of the air pump) to find the available power.

TO PRESERVE EGGS.

ENQUIRER, Mapleton.—

Eggs may be preserved for many months in either lime-water or water-glass (sodium silicate). The lime-water is made by putting 2 or 3 lb. of unslacked lime into 5 gallons of water. Allow it to settle, then pour off the clear water, and immerse the eggs in it. Some add 1 lb. of salt to the lime, but this is not to be recommended, as it gives a limy taste to the eggs.

Water-glass.—Make a 10 per cent. solution. Or else take 1 part, by measure, of semi-fluid water-glass and 20 parts by measure of water. Boil the water, and when cool add the water-glass, which must be as thick as treacle—not the weaker, liquid form. One gallon of this pickle will cover 10 dozen to 12 dozen eggs, and will cost about 4d. The eggs must be perfectly fresh, and no cracked eggs must be placed in the lime-water or water-glass pickle. We have kept eggs in lime-water for nine months, and they were quite fresh at the end of that time. Keep the vessel of eggs away from the light, if lime-water is used, as the light causes a precipitation of the lime held in solution.

TROUBLE WITH STALLION—ANGORAS.

W. A. C. WENDORF, Burnett's Creek, Boonah.—

TROUBLE WITH STALLION.

The veterinary opinion is that your stallion has the mange, but, as you appear sure that it is not so, it may be a case of *Preuritis* or itching. Wash with carbolic acid, 1 in 34 or 40, or with kerosene, to allay the itching.

ANGORAS.

Question 1.—Which is the very quickest way to start a flock so as to get the best quality of mohair?

Answer 1.—If expense is no object, get the purest bucks and does from the South. Mr. Missing, the well-known Angora goatbreeder, of Tallegalla, Tiaro, is building up with good bucks from the South and the best does procurable locally.

Question 2.—Which is the nearest market?

Answer 2.—Saltaire, a suburb of Bradford, England.

Question 3.—How many does is a fair number for one buck?

Answer 3.—About 70.

Question 4.—Can the buck be put with his progeny, and again with their succeeding progeny?

Answer 4.—A really good buck put to well-grown does would stamp his own progeny very strongly with his individuality, and this would probably not injure the constitution of the second cross kids, but this might be in-breeding too much. Mr. Missing, however, says that, at present, he has had no opportunity of judging of the effects of this in-breeding.

Question 5.—When crossing a pure Angora buck with common goats, how long could he run with them?

Answer 5.—A lifetime.

Question 6.—At what age does a pure buck become unprofitable?

Answer 6.—Probably from ten to twelve years.

Question 7.—Where can common white nannies be obtained?

Answer 7.—They must be picked up here and there.

Question 8.—Is there any information available concerning the effects of scrub or cattle ticks on Angoras? Are the dingoes very destructive to them? How should they be protected against dingoes?

Answer 8.—Scrub ticks will kill them if not picked off. If a kid appears dozy and unable to follow the flock, search for the scrub tick, remove it, and the kid will be all right. Angoras do not carry cattle ticks. Dingoes and eagle-hawks are very destructive. Poisoning heavily is the only remedy, if the goats are allowed to run at large without shepherding.

A pamphlet on Angora goats has been forwarded to you.

WHITE CEDAR BERRIES.

ELI SHAW, Pickenjinnie.—

The fruit of the White Cedar *(Melia azedarach)* is very poisonous. Mr. F. M. Bailey, the Colonial Botanist, says that this has been known to botanists for over 150 years. If the pulp of the seed is mixed with grease, it will, it is stated by Colonel Heber Drury, kill a dog, although he adds this is doubtful. A decoction of the leaves is said to be injurious to insects. There is little doubt that your pigs died from the effects of eating the berries.

LICE ON SWINE.

Isis Farmer, Cordalba.—

Lice on swine are generally caused by poverty, or through the stock being badly kept. The best remedy is:—Pour about a gill of kerosene oil into a dish, and with a paint brush or woollen rag rub the oil up and down the back of the animal, behind the forelegs, and on the flank; be particular about the last two places, for it is where the lice deposit their eggs, which, if not destroyed, will hatch out in about five days. If it be a black pig, these eggs can be plainly seen, being about the size of timothy seed, and lying close to the skin, fast to the hair. You need not fear to use the oil freely, as it will not injure the pig in the least.

HORSE-POWER FOR PUMP.

Black Diamond, Proserpine.—

We have submitted your question to a practical man, and he says you can certainly lift the water with a chain-pump and a 3-inch pipe to 40 feet with a one-horse gear, but two would be preferable.

The horse's speed, working for ordinary purposes, is fair walking speed.

BRANDING MIXTURE.

W. Flitcroft, Warwick.—

Barium sulphite, 16 oz.; coal tar, 16 oz. Mix thin with American potash, 32 oz.; turpentine, 32 oz.; water, 32 oz.

Mix the barium sulphite and coal tar thoroughly, as is required by the nature of the two substances. Mix the three last—potash, turpentine, and water—so as to secure perfect fluidity and amalgamation. Gradually incorporate the two masses.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	AUGUST. Prices.
Apples, Eating, per packer	6s. 6d. to 8s.
Apples, Cooking, per case	6s. to 6s. 6d.
Apples, Tasmanian, Cooking, per case	...
Apples, American, Eating	...
Apples, American, Green	...
Lemons, Italian, per 360	...
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Lemons, New South Wales, per case	2s. 6d. to 3s.
Oranges, Italian, per 180	...
Oranges, Local, per case	3s. to 3s. 6d.
Oranges, Sydney (packers)	...
Mandarins, Local, per case	3s. 6d. to 4s. 6d.
Mandarins, Bowen	...
Apricots, New South Wales, boxes (half-gincase)	...
Apricots, American, per 108's	5s.
Plums, American, per 108's	5s. 6d.
Plums, Sydney, per 108's	...
Peaches, half-gincase	...
Nectarines, half-gincase	...
Gooseberries, English	...
Cherries, American, per lb.	1s.
Passion Fruit, quarter-case	3s. to 3s. 6d.
Mangoes, per case	...
Pineapples, rough, per dozen	9d. to 1s. 3d.
Pineapples, Queen „	2s. 6d. to 3s.
Melons	...
Rockmelons	...
Bananas, per bunch	9d. to 1s.
Bananas, per dozen	$1\frac{3}{4}$d.
Tomatoes, quarter-case	3s. to 3s. 6d.
Papaw Apples, quarter-case	...
Custard Apples, quarter-case	2s. 6d.
Granadillas, case	...
Seville Oranges, apple-case	2s.
Cape Gooseberries, quart	$3\frac{1}{2}$d.
Pears, American, per 72's	6s.
Pears, Tasmanian quarter-case	...
Rosellas, per sugar-bag	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR AUGUST.

Article.		AUGUST. Prices.
Bacon (Pineapple)	lb.	$5\frac{1}{2}$d. to 7d.
Barley, Malting	bush.	...
Bran	ton	£2 10s. to £2 15s.
Butter, Factory	lb.	8d. to $8\frac{1}{2}$d.
Chaff, Mixed	ton	£2 10s. to £2 15s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR AUGUST—*continued.*

Article.		AUGUST. Prices.
Chaff, Oaten	ton	£2 10s. to £3 15s.
Chaff, Lucerne	,,	£2 to £2 17s. 6d.
Chaff, Wheaten	,,	£2
Cheese	lb.	4½d. to 5d.
Flour	ton	£7 10s. to £8 5s.
Hay, Oaten	,,	£4 17s. 6d. to £5
Hay, Lucerne	,,	£1 15s. to £2
Honey	lb.	1¾d. to 2d.
Maize	bush.	1s. 9d. to 1s. 11d.
Oats	,,	2s. to 3s. 8d.
Pollard	ton	£2 15s. to £3
Potatoes	,,	£2 10s. to £3 10s.
Potatoes, Sweet	,,	£1 to £1 5s.
Pumpkins	,,	10s. to £1 6s. 8d.
Wheat, Milling	bush.	2s. 10½d. to 3s.
Wheat, Chick	,,	1s. 6d. to 2s. 3d.
Onions	ton	£3 7s. 6d. to £3 12s. 6d.
Hams	lb.	8½d. to 9½d.
Eggs	doz.	5d. to 7½d.
Fowls	pair	2s. to 3s. 6d.
Geese	,,	4s. 9d. to 5s. 9d.
Ducks, English	,,	2s. 9d. to 3s. 2d.
Ducks, Muscovy	,,	2s. 9d. to 4s. 2d.
Turkeys, Hens	,,	5s. to 7s. 6d.
Turkeys, Gobblers	,,	8s. 6d. to 12s. 6d.

ENOGGERA SALES.

Animal.	JULY. Prices.
Bullocks	£8 15s. to £9 7s. 6d.
Cows	£6 17s. 6d. to £7 10s.
Wethers, Merino	19s. 9d. to £1 2s. 9d.
Wethers, C.B.	£1 1s. 6d. to £1 3s.
Lambs	15s. to 15s. 3d.
Baconers	£1 14s.
Porkers	£1 2s.

Orchard Notes for September.

By ALBERT H. BENSON.

The planting and pruning of all deciduous trees should have been completed even in the coldest districts by the end of August, and during the present month the orchardist should disbud and thumb-prune the young trees as soon as they start out into growth. Judicious thumb-pruning is necessary in order to reduce the number of branches, only those buds being allowed to develop into branches that will be required to form the future head of the tree, all the rest being either removed or, better still, pinched back and converted into spurs which will eventually bear fruit, and which, meanwhile, will produce a tuft of leaves that will tend to strengthen the branch and to protect it from sunburn. Spraying should be continued during the month in the case of deciduous trees attacked by fungus diseases, such as the shot-hole fungus or rust of the apricot and the Windsor pear blight of pears, the material used being Bordeaux mixture. Where leaf-eating insects of any kind are troublesome, a little Paris green—1 oz. to 10 gallons—should be added to the Bordeaux mixture, the spraying material being then both an insecticide and fungicide, and two pests are destroyed by the one spraying. Vines that have not been treated for black spot, as described in the Orchard Notes for August, should be treated at once; and vine-planting should be done during the beginning of the month, though if the cuttings have been kept in a cold place planting can be continued all through the month. In planting grape-cuttings, see that the cutting is always planted firmly, and that the soil comes into direct touch with it all round, as, if not, it is very apt to dry out. Plant the cutting with the top eye just on a level with, or rather slightly below, the surface of the ground, not with 6 inches or more of the cutting sticking out of the ground, as the nearer to the ground the main stem of the vine starts the better the vine will be, and the easier will be its subsequent training.

Orange-trees will be in full blossom during the month, and in the earlier districts the young fruit will probably be ready to treat for Maori or rust towards the end of the month. Maori is caused by a very small mite, which begins its attack on the young fruit when it is about the size of a marble, though the injury it causes is seldom noticeable till the fruit begins to ripen. Spraying the trees with a mixture of sulphur and soft soap or with a weak solution of sulphide of soda, or dusting the trees with fine sulphur, will destroy these mites. During the end of the month pineapple and banana suckers may be set out during favourable weather in the earlier districts, but it is not advisable to plant out too early, as they do not root readily till the soil is thoroughly well warmed. Orchards and vineyards should be kept well cultivated during the month, as if there is a dry spring the success of the crop will depend very much on the manner in which the orchard is kept, as the better the orchard is cultivated the longer it will retain the moisture required by the trees for the proper development of their fruit. Quickly-acting manures, such as sulphate of potash, sulphate of ammonia, and superphosphate, can be applied to fruit trees during the month if there is any suitable showery weather, but should not be applied during either a very dry or a very wet spell. Fruit trees should be mulched, and when cow peas are required for mulching they can be planted towards the end of the month.

During the month a careful examination should be made of all fruit to see if any contains larvæ of fruit fly; and if such are found they should be destroyed, as if extreme care is taken during this and the two following months

to destroy the larvæ of all fruit flies, whenever and wherever found, this great curse of the fruitgrower would be greatly reduced, as it is on the careful destruction of the earlier broods of flies that the saving of the main crop of fruit will principally depend. Though the first damage caused by the flies is comparatively insignificant, they reproduce themselves so rapidly that a few mature insects in the beginning of the season become many thousands before it closes.

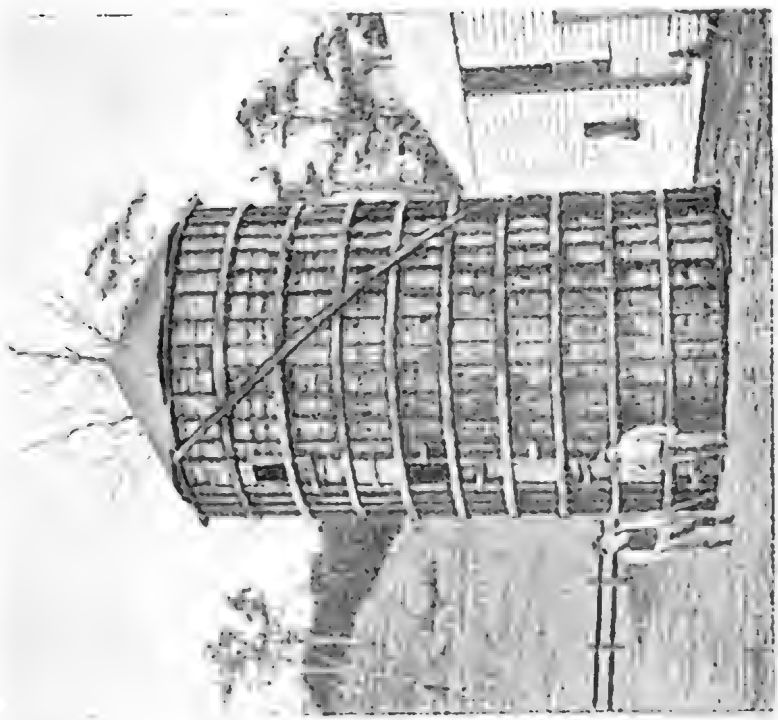
Farm and Garden Notes for October.

Field.—With the advent of warm weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore our advice of last month holds with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, sorghum, setaria, imphee, prairie grass, panicum, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, earth nuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. See our instructions in last month's *Journal* as to the planting of *Agave rigida* or sisal hemp. The demand for this fibre is constantly increasing, and the supply does not overtake the demand, hence prices keep high. The latest August sales in America brought over £37 6s. 8d. per ton. Plant only on *dry* soil. Cotton may still be sown.

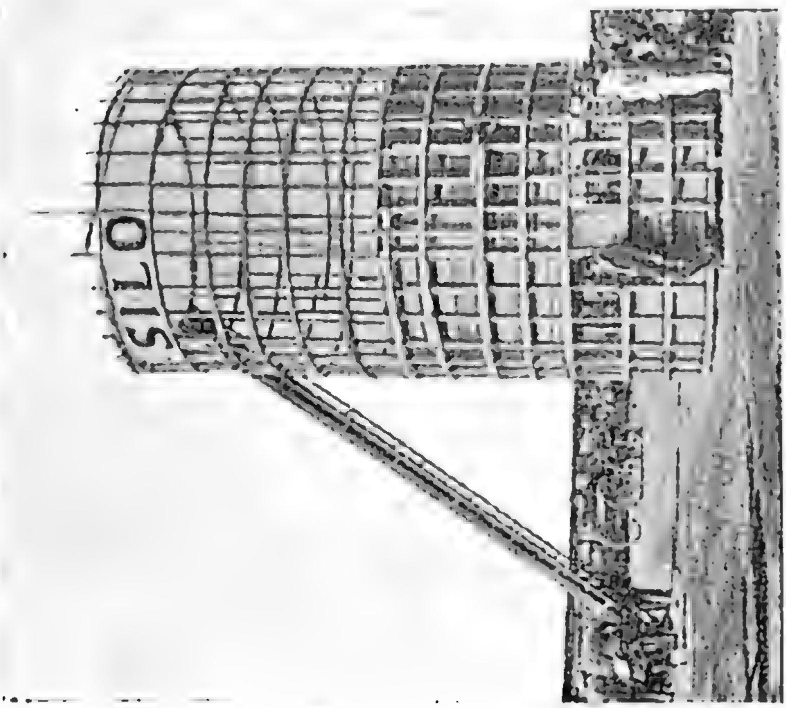
Kitchen Garden.—Our notes for this month will not vary much from those for September. Sowings may be made of all kinds of vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the crops will be drawn and worthless. Thin out melon and cucumber plants. Give plenty of water and mulch tomato plants planted out last month. Remember to water early in the morning or late in the evening, and next day stir the soil to prevent it caking.

Flower Garden.—Plant chrysanthemums, giving them plenty of water. The garden should now be showing the results of the care bestowed upon it during the last three months. Plant tuberoses, crinums, gladiolus and other bulbs. Plant out palms and all kinds of tropical and semi-tropical plants. If the weather should be hot after planting, water and shade the plants. Roses should now be in full bloom. Sow dianthus and snapdragon; plant out coleus. Do as much work as possible now on dull, showery days. Having finished transplanting, the principal work will consist of raking and stirring the beds, staking, shading, and watering. As rose blooms fade cut off the spent flowers, and keep the bushes free from aphis.

Plate XII.



Silo Completed.



Silo in Course of Construction.

Agriculture.

A GOOD CHEAP SILO.

Notwithstanding the splendid seasons which have been the rule since the beginning of 1903, yet it should always be remembered that droughts will occur at intervals, of more or less intensity, possibly all over the State. Wise men will take care to be prepared for the trouble when it arises, and there is no better way of guarding against the total loss of stock, such as occurred in 1901 and 1902, than by having a good stock of ensilage at hand. Throughout this summer and winter, fodder, both artificially sown and native to the soil, has been so plentiful that prices have been too low to make it payable to take it any long distance to a railway station in the shape of hay. There are not stock enough as yet on farms and stations to consume this superabundance of feedstuff. But there is no reason why it should be wasted when there is such a simple method of turning it to good account by making silage stacks or by building cheap silos.

Station, Farm, and Dairy lately gave details for the construction of a cheap silo as advocated by Dr. Cherry, of the Victorian Agricultural Department. We reproduce two of the illustrations—one showing the silo in course of construction, the other the complete silo. The cost of this silo, including all labour, is about £17—the price of one first-class cow or of two good ones, or half the price of a good plough or wagon horse—but which might be the means of preserving the lives of twenty cows and horses on the farm in drought time.

Dr. Cherry says:—Probably the most satisfactory method is to build a wood silo on a brick foundation, the latter extending, say, 5 feet into the ground. The wood frame and hoops are to be erected in the way described below, and will remain as permanents parts of the structure. The inside lining and outside covering may be modified to suit the ideas and purse of the proprietor. These details will be discussed later on. The cheapest lining is $\frac{3}{8}$-wood, covered on the inside with acid-proof paper. Several brands of paper are on the market, and the thinnest will last two or three years. Next to paper comes plain sheet iron, either black or galvanised. This requires to be coated with P. and B. paint to resist the acid. The iron may be substituted for the paper lining after the latter has served one or two years, and the farmer is convinced of the value of the silo. For the first year or two no covering is needed beyond a coat of tar on the outside of the lining-boards, but later on the outside may be covered with weather boards or with sheet iron.

Diameter, 13 feet; height, 25 feet; capacity, 55 tons. The following materials will be required:—16 pieces 2 feet 6 x 6 red gum stumps; 15 pieces 15 feet 4 x 2 hardwood studs; 15 pieces 12 feet 4 x 2 hardwood studs; 15 pieces 15 feet 4 x $1\frac{1}{2}$ hardwood studs; 15 pieces 12 feet 4 x $1\frac{1}{2}$ hardwood studs; 48 pieces 15 feet 4 x $\frac{1}{2}$ hardwood battens; 8 pieces 5 feet 9 x 3 hardwood plates; 1,300 feet run, 9 x 6-out spruce lining; 50 feet run, 6 x $\frac{7}{8}$ T. and G., white; 1 roll P. and B. building paper, or 56 sheets 6 x 3 x 26-gauge plain iron.

A suitable site having been selected, and levelled if necessary, place a stake in the centre of this space, and with a lath 7 feet long describe a circle 13 feet in diameter. This circle then forms the outside of the line of the stumps. Fix the stumps at equal distances round this circle, about 2 feet 5 inches from centre to centre. The tops should not project more than 6 inches above the level of the ground, and they require to be well rammed, as the stability of the silo against the wind is largely dependent upon the way it is fixed to the foundations. Mark on the top of the stumps a circle with a radius of 6 feet 4 inches, and fix the 9 x 3 plates in position, so that the outside of each plate at the middle of its length comes flush to this circle, and the ends project beyond it. The line by which to cut each plate, in order that they may

form a regular octagon, may be found by laying on it the lath from the centre peg. The exact length of the outside edge of each plate will be found to be 4 feet 11¾ inches. The plates are then securely spiked or bolted to the stumps. Next mark on the plates two circles with a radius of 6 feet 4 inches and 6 feet 2 inches respectively. The inside one is the line of the inside of the silo. The 4 x 2 studs are then halved for 4 inches at one end, and their positions are marked on the outer circle 16 inches apart. There will be one space a couple of inches wider, which will serve for the port holes. Where necessary, the plates are checked out to the 6 feet 4 inch line, so as to take the end of the studs, the inside edge of the studs thus standing true to the 6 feet 2 inch line all round the silo. In fixing the studs in position, care must be taken to keep them plumb both ways, the 12-feet and 15-feet studs being placed alternately. When eight or ten of them have been braced in position, fix on temporarily two or three of the inside lining boards, and then nail on the battens to form the first hoop 18 inches from the plate. As it takes three battens to go round the whole silo, the ends should not be butt-jointed on the same stud, but should overlap by at least one stud. When the battens are fixed so as to complete the hoops to a height of 12 feet, the top studs, 4 x 1½, are nailed on to the sides of the 4 x 2's, about 2 feet being allowed for the lap. The outside hoops are made to "break joints" as much as possible, so as to add to the strength of the structure. The same applies to the ⅝ inside lining; but, in this case, "butt joints" are made on each stud, so that the inside surface may be finished perfectly smooth. The paper may be tacked on in horizontal strips at the time of filling.

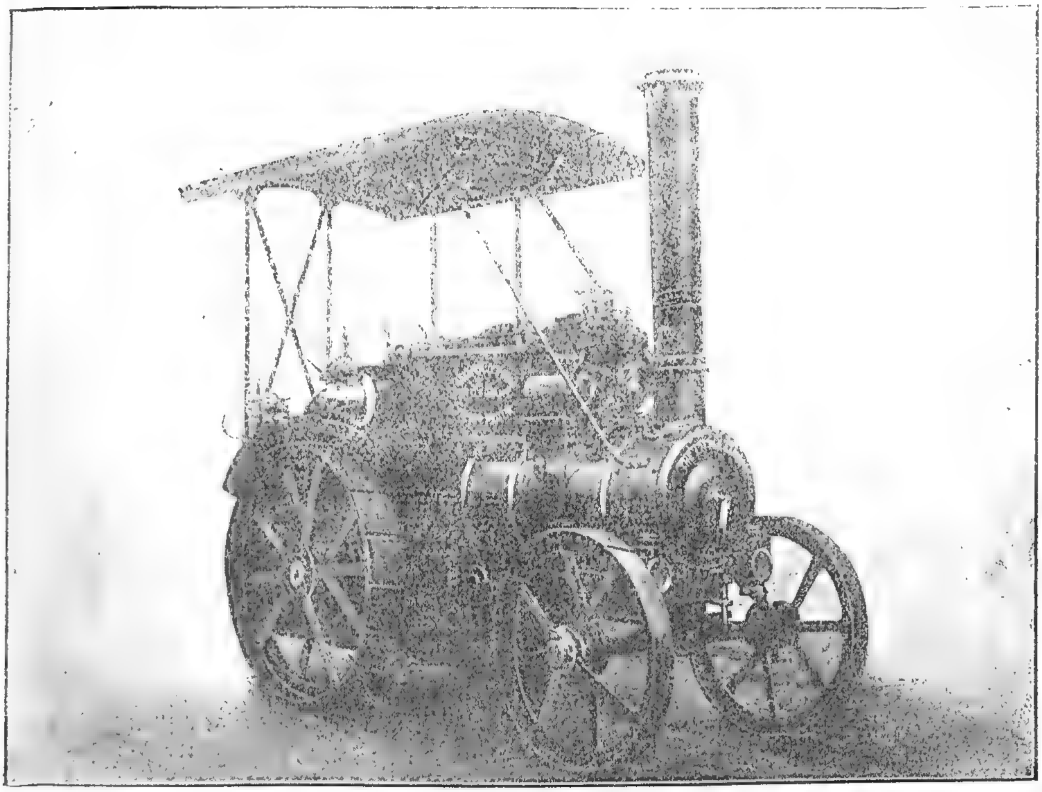
The port holes are made at intervals of 4 feet vertically, and should be about 18 inches square. The doors are made of a double thickness of 6 x 1 T. and G. Three 18-inch lengths are placed side by side, and three similar pieces nailed crosswise to them with a sheet of P. and B. building paper between. The stops to receive the doors are made of 3 x 1, nailed to the sides of the two studs which form the jambs, so that the inside of the door is flush with the inside of the silo. The sill and lintel to complete the port hole may be made of 3 x 2 hardwood. The doors are placed in position as the silo is filled. The weight of the silo keeps them secure, and they are knocked back into the silo as each becomes exposed by the silo being emptied from the top. Great care must be taken that the joints exclude all air and water, as the silage is often damaged at the port holes. The doors should be covered on the inside with a sheet of P. and B. paper, with a good lap, and the joints may be luted on the outside with clay if necessary. The roof may be left until the silo is filled. In dry districts a thatch of straw will be sufficient, but the best method is to adopt the circular conical roof. Make a light frame from the tops of the studs to a centre post, and cover it with iron or ruberoid. A top plate marked and cut out exactly the same as the bed plate, but made of lighter material, is useful for keeping the studs upright during the erection of the frame.

Silos built in the way here described were erected last season by Messrs. Galbraith and Sons, Tyers, Traralgon, and by Mr. Chalmers, Leongatha. The total cost, including labour, was £17.

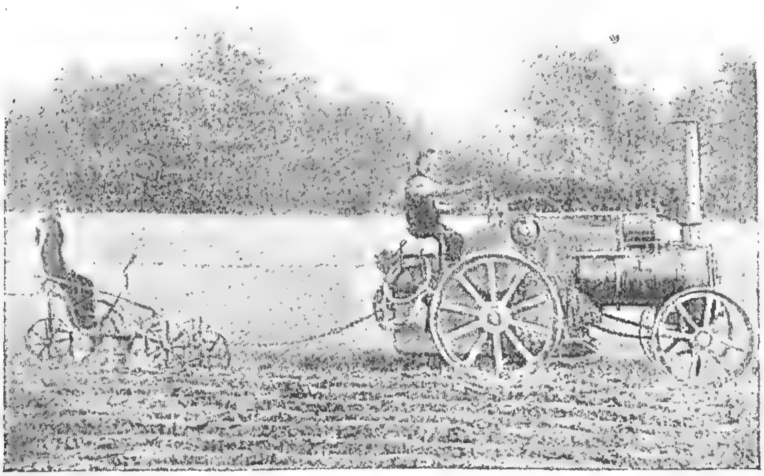
THE LITTLE GIANT AGRICULTURAL MOTOR.

The question of "transport made easy" is one of vital importance to pastoralists, agriculturists, and others who carry on their business, in most cases, either at long distances from railway stations or in localities where the hilly nature of the country renders the cost of even a few miles of railway prohibitive. To meet the difficulty, Messrs. Trackson Brothers, Limited, have determined to establish the Trackson's Transport, Limited, principally in the Western country. To this end they have had six small but exceedingly powerful steam motors made by Messrs. W. Tasker and Sons, Andover, Hants, England. The first two of these have arrived, and we had the pleasure of inspecting one at work. At the first glance the engine or motor rather appears a mere toy, and we were surprised to learn that the compound cylinder motor works up to 37-h.p., and the single to 27-h.p. At a trial in

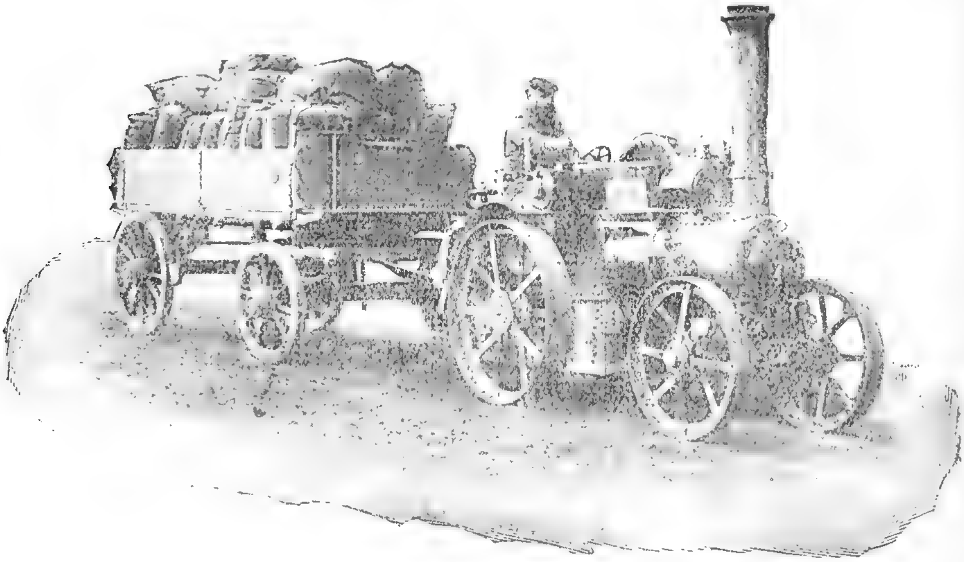
England—Mr. Trackson himself driving—a load of 4 tons 14 cwt. was placed in a truck weighing 2 tons, and this the compound cylinder Little



Giant drew along a good road at a speed of 7 miles per hour on all grades up to 1 in 9. Eleven miles were covered in $1\frac{3}{4}$ hours. The water consumed was 69 gallons; coke, 49 lb. The steam pressure averaged 210 lb. per square inch, the maximum pressure being 220 lb. A trial was also made of the single cylinder motor. A similar load was attached to it, and it drew it $8\frac{1}{2}$ miles in $1\frac{1}{4}$ hours. The roads were in good order, the steepest gradient 1 in 9. Seventy gallons of water and $2\frac{1}{2}$ buckets of coke were used. The steam pressure was 150 lb., the maximum being 170 lb. per



square inch. The water supply from the injector was always regular. Water is carried in three tanks, which hold sufficient water for a run of 40 miles. Although coke is used as fuel, the firebox is arranged to enable hardwood to be used. The consumption of coke is 1 lb. per ton per mile. The motors have two speeds, regulated by clutches—one of 4 miles, the other of 7 miles per hour. The machine can be used for a multitude of purposes. As a stationary engine it can be used for hauling timber, threshing wheat, sawing wood, &c., and, by means of a drum on which a wire rope will work, the engine can stand on level ground and haul heavy weights up a steep incline. It is adapted for



ploughing and many other agricultural operations. In fact, it will plough the ground, open drills, haul the seed drill, harrow, thresh, and draw the farm produce to market. On a level road it will draw a load of 40 tons at a fair speed.

As stated, the object of importing these motors is, to establish a transport service connecting districts not in touch with railways, with the lines. The tires of the wheels are broad, but, if necessary, the width can be doubled to enable the engine to get easily over soft, muddy, or sandy spots. The transport service will be inaugurated as soon as the other four engines arrive, which will be in two or three months.

Our illustrations show the machine at work on the farm and on the road.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

Returns from 1st to 31st July, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire	22 Nov., 1903	560	4·4	27·59	
Amy ...	,, ...	5 June, 1904	924	3·8	39·32	
Blanche ...	,, ...	17 Oct., 1903	302	4·3	14·54	With first calf
Blank ...	,, ...	10 May, 1904	772	3·7	31·99	
Blink ...	,, ...	27 April, 1903	465	4·0	20·83	
Cockey ...	,, ...	22 Dec. ,,	544	3·4	21·83	With first calf
Lass ...	,, ...	12 Mar., 1904	746	3·7	30·91	
Laura ...	,, ...	3 Dec., 1903	605	3·9	26·42	
Linnet ...	,, ...	3 Jan., 1904	622	3·9	27·16	
Lowla ...	,, ...	3 Mar. ,,	781	4·0	34·98	
Lena ...	,, ...	26 Feb., 1903	434	4·5	21·87	
Laverock ...	,, ...	17 July, 1904	135	3·6	5·44	
Lightning ..	,, ...	15 Jan. ,,	555	3·7	23·00	With first calf
Lulu ...	,, ...	26 Oct., 1903	321	3·6	12·94	With first calf
Lonesome ...	,, ...	10 Feb., 1904	530	3·6	21·36	
Luck ...	,, ...	28 Nov., 1903	289	4·3	13·91	With first calf
Renown ...	,, ...	29 Feb., 1904	635	3·7	26·31	
Realm ...	,, ...	15 Dec., 1903	321	3·8	13·66	
Ruby ...	,, ...	18 Jan., 1904	614	4·2	28·8	
Ream Routhi	,, ...	3 April ,,	627	3·9	27·38	
Rosebud ...	,, ...	27 Nov., 1903	641	4·0	28·71	
Ruth ...	,, ...	15 Dec. ,,	614	3·6	24·75	
Chocolate ...	Shorthorn ...	17 Nov. ,,	470	3·6	18·95	With first calf
Cherry ...	,, ...	2 Feb., 1904	530	3·6	21·36	
Dora... ..	,, ...	1 May ,,	752	3·6	30·32	
Dainty ...	,, ...	14 July ,,	303	3·5	11·87	With first calf
Gem ...	,, ...	18 April ,,	618	3·6	24·91	With first calf
Horney ...	,, ...	3 April ,,	533	3·6	21·49	
Jewess ...	,, ...	16 July ,,	208	3·5	8·15	With first calf
Kathleen ...	,, ...	15 Jan. ,,	751	3·6	30·28	With first calf
Kit ...	,, ...	26 Mar. ,,	828	3·7	34·31	
Lady Vixen	,, ...	16 Jan. ,,	712	3·6	28·7	
Louisa ...	,, ...	3 Jan., 1903	374	4·1	17·17	
Mabel ...	,, ...	9 July, 1904	424	3·6	17·09	With first calf
Nestor ...	,, ...	7 Jan. ,,	647	4·4	31·88	
Princess ...	,, ...	27 Nov., 1903	435	4·0	19·48	
Plover ...	,, ...	5 May, 1904	542	3·5	21·24	
Pleasant ...	,, ...	20 July ,,	174	3·6	7·01	With first calf
Peggie ...	,, ...	31 May ,,	673	3·9	29·39	
Queenie ...	,, ...	22 Mar. ,,	711	3·6	28·66	
Rose ...	,, ...	19 July ,,	417	3·9	18·21	
Roany ...	,, ...	17 July ,,	409	4·0	18·32	
Violet ...	,, ...	7 April ,,	688	3·7	28·51	
Bliss ...	Jersey	29 Feb. ,,	486	4·3	23·4	With first calf
Carrie ...	,, ...	16 Jan. ,,	612	4·2	28·78	With first calf
Connie ...	,, ...	4 June ,,	471	4·4	23·21	
Effie ...	,, ...	22 June ,,	753	4·0	33·73	
Ivy ...	,, ...	1 Jan. ,,	376	4·0	16·84	
Jersey Belle	,, ...	2 Mar. ,,	602	5·0	33·71	
Playful ...	,, ...	22 May ,,	503	4·5	25·35	
Tiny ...	,, ...	1 Dec., 1903	385	5·0	21·56	
Drone ...	Ayrshire Sh'rth'rn	7 Oct. ,,	381	3·8	16·21	
Jeanie ...	,, ,,	6 Jan., 1904	525	3·6	21·16	
Mince ...	,, ,,	10 Jan. ,,	305	3·9	13·32	With first calf
Nina ...	,, ,,	10 Feb. ,,	215	4·1	9·87	With first calf
Nada ...	,, ,,	18 Jan. ,,	503	3·9	21·97	With first calf
Ping Pong ...	,, ,,	18 July, 1903	456	3·6	18·38	With first calf
Rita ...	,, ,,	17 Oct. ,,	271	4·2	11·62	With first calf
Venus ...	,, ,,	13 Feb., 1904	334	3·9	14·58	
No. 46 ...	,, ,,	8 April, 1903	328	3·8	13·95	

THE DAIRY HERD—*continued.*

Returns from 1st to 31st July, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test	Commercial Butter.	Remarks.
			Lb.		Lb.	
No. 48 ...	Ayrshire Sh'rt'hn	4 Feb., 1904	583	3·6	23·5	
No. 107 ...	,, ,,	25 July ,,	88	3·7	3·64	With first calf
Molly ...	Grade ,,	19 Feb. ,,	515	3·8	21·91	
Rosella ...	,, ,,	27 Feb. ,,	571	3·6	23·02	
Rowly ...	,, ,,	17 July ,,	262	3·7	10·75	
Brindle ...	Jersey ,,	16 Dec., 1903	452	4·1	20·75	
Magpie ...	Holstein ,,	9 July, 1904	714	3·7	29·68	
Peawee ...	,, ,,	21 July ,,	174	3·5	6·87	With first calf
Angel ...	Holstein Devon...	11 Mar. ,,	747	4·2	35·13	
Whitefoot ...	,, ,,	20 June ,,	777	3·8	35·43	
Reanie ...	Holstein Hereford	21 Sept., 1903	616	3·7	25·52	
Donah ...	Holstein	2 Feb., 1904	547	3·6	22 05	With first calf
Damsel ...	,, ...	3 April ,,	884	3·6	35·64	
Witch ...	Grade Jersey ...	10 June ,,	911	4·0	40·81	
Whanger ...	,, ,, ...	14 July ,,	277	4·1	12·71	
Fancy ...	South Coast ...	11 Oct., 1903	735	4·2	34·57	
Grace ...	,, ,, ...	28 Oct. ,,	385	4·0	17 24	
Lady Rose ...	Guernsey ...	1 Feb., 1904	321	6·6	23 72	

The cows were fed night and morning on green lucerne and barley, as well as being grazed on natural pastures.

Returns from 1st to 31st August, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire	22 Nov., 1903	156	4·2	7·33	Dry, 15-8-04
Amy ...	,, ...	5 June, 1904	747	3·6	30·12	
Blanche ...	,, ...	17 Oct., 1903	73	4·4	3·59	Dry, 27-8-04
Blank ...	,, ...	10 May, 1904	650	3·8	27·66	
Blink ...	,, ...	27 April, 1903	328	4·3	15·79	
Cockey ...	,, ...	22 Dec. ,,	352	3·5	13·79	
Lass ...	,, ...	12 Mar., 1904	696	3·9	30·4	
Laura ...	,, ...	3 Dec., 1903	445	4·2	20·93	
Linnet ...	,, ...	3 Jan., 1904	535	4·0	23·96	
Lowla ...	,, ...	3 Mar. ,,	645	4·2	30·34	
Lena ...	,, ...	26 Feb., 1903	364	4·2	17·12	
Lightning ...	,, ...	15 Jan., 1904	513	3·6	20·68	With first calf
Lulu ...	,, ...	26 Oct., 1903	391	4·0	17·51	With first calf
Lonesome ...	,, ...	10 Feb., 1904	403	3 8	17·15	
Luck ...	,, ...	28 Nov., 1903	87	4·3	4·18	Dry, 16-8-04
Laverock ...	,, ...	17 July, 1904	805	4·0	36·06	
Renown ...	,, ...	29 Feb. ,,	518	3·5	20·3	
Realm ...	,, ...	15 Dec., 1903	363	4·0	16·26	
Ruby ...	,, ...	18 Jan., 1904	366	4·4	18·03	
Ream Routhi	,, ...	3 April ,,	573	4·0	25·67	
Rosebud ...	,, ...	27 Nov., 1903	566	4·5	28·52	
Ruth ...	,, ...	15 Dec. ,,	572	4·3	27·54	
Chocolate ...	Shorthorn ...	17 Nov. ,,	454	3·4	16·16	With first calf
Cherry ...	,, ...	2 Feb., 1904	458	3·9	20·00	
Dora ...	,, ...	1 May ,,	622	3·7	25·77	
Gem ...	,, ...	18 April ,,	522	3·5	20·46	
Horney ...	,, ...	3 April ,,	543	3·4	20·67	
Dainty ...	,, ...	14 July ,,	722	3·5	28·3	With first calf
Jewess ...	,, ...	16 July ,,	587	3·3	21·69	With first calf
Kathleen ...	,, ...	15 Jan. ,,	387	3·8	16·47	With first calf
Kit ...	,, ...	26 Mar. ,,	719	3·5	28·18	
Lady Vixen	,, ...	16 Jan. ,,	556	3·8	23·66	
Louisa ...	,, ...	3 Jan., 1903	447	4·4	22·02	
Mabel ...	,, ...	9 July, 1904	683	4·0	30·59	With first calf
Nestor ...	,, ...	7 Jan. ,,	453	4·2	21·3	

THE DAIRY HERD—*continued.*

RETURNS FROM 1ST TO 31ST AUGUST, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Princess ...	Shorthorn ...	27 Nov., 1903	408	4·1	18·73	
Plover ...	"	5 May, 1904	476	4·3	22·92	
Pleasant ...	"	20 July "	788	3·5	30 88	With first calf
Queenie ...	"	22 Mar. "	692	3·5	27·12	
Rose ...	"	19 July "	1,075	3·5	42·14	
Roany .	"	17 July "	1,085	4·1	49·82	
Violet ...	"	7 April "	624	3·8	26·55	
Winnie ...	"	5 Aug. "	547	3·8	23·28	
Bliss ...	Jersey	27 Feb. "	438	4·0	19·62	With first calf
Carrie ...	"	16 Jan. "	394	4·5	19·85	
Connie ...	"	4 June "	407	4·0	18·23	
Effie ...	"	22 June "	679	4·1	31·17	
Eileen ...	"	29 July "	523	4·5	26·36	
Ivy ...	"	1 Jan. "	284	4·1	13·04	
Jersey Belle	"	2 Mar. "	442	5·2	25·74	
Tiny ...	"	1 Dec., 1903	338	5·8	21·95	
Drone ...	Ayrshire Sh'rth'rn	7 Oct. "	272	3·6	10·96	
Jeanie ...	" " ...	6 June, 1904	534	3·9	23·32	
Mince ...	" " ..	10 Jan. "	118	4·4	5·81	Dry, 15-8-04
Nina ...	" " ...	10 Feb. "	27	4·5	1·36	Dry, 5-8-04
Nada ...	" " ...	18 Jan. "	438	4·0	19·62	
No. 46 ...	" " ...	8 April, 1903	222	4·0	9·94	
No. 48 ...	" " ...	4 Feb., 1904	613	3·6	24·71	
Ping Pong ...	" " ...	18 July, 1903	407	4·0	18·23	With first calf
Rita ...	" " ...	17 Oct. "	105	4·0	4·7	Dry, 16 8-04
Venus ...	" " ...	13 Feb., 1904	127	4·3	6·11	Dry, 15-8-04
No. 107 ...	" " ...	25 July "	562	3·4	21·4	With first calf
Molly ...	Grade " ...	19 Feb., 1904	522	4·0	23·38	
Rosella ...	" " ...	27 Feb. "	491	3·7	20·34	
Rowly ...	" " ...	17 June "	633	3·5	24·81	
Lemon ...	" " ...	5 Aug. "	699	3·6	28·8	
Brindle ...	Jersey " ...	16 Dec., 1903	450	4·4	22·17	
Mona ...	Holstein Sh'rth'rn	1 Aug., 1904	1,146	4·3	55·19	
Magpie ...	" " ...	9 July "	908	4·2	42·71	
Peawee ...	" " ...	21 July "	735	3·7	30·45	With first calf
Dripping ...	" " ...	21 July "	577	3·6	23·26	With first calf
Angel ...	Holstein Devon	11 Mar. "	658	4·6	33·9	
Whitefoot ...	" " ...	20 June "	770	3·6	31·04	
Reanie ...	Holstein Hereford	21 Sept., 1903	584	4·1	26·81	
Donah ...	Holstein	2 Feb., 1904	514	3·8	21·87	
Damsel ...	"	3 April "	787	3·4	29·96	
Whanger ...	Grade Jersey ...	14 July "	522	4·5	26·3	With first calf
Fancy ...	South Coast ...	14 Oct., 1903	521	4·0	23·34	
Grace ...	" " ...	28 Oct. "	260	4·2	12·23	Dry, 28-8-04
Lady Rose ...	Guernsey ...	1 Feb., 1904	292	7·0	22·89	

The cows were fed with lucerne and oats, and were occasionally grazed on the *Paspalum dilatatum* patch.

CAUSES OF VARIATION IN THE BUTTER-FAT PERCENTAGES AND WEIGHT OF MILK AND CREAM.

By G. SUTHERLAND THOMSON, F.R.S., Ed., N.D.D., &c.,
Government Dairy Instructor, Queensland.

(*Concluded.*)

FACTORY RESULTS IN CREAM TESTING.

With a view to demonstrate in a practical manner that distance in the conveyance of cream and times of delivery at the factory at the present time affect the percentages of butter fat, I append the following list of readings taken from the January records at one of our factories.

Showing even returns for twelve days from cream supplied to factory twice daily by a very careful farmer:—

Distance from factory, 4 miles.

Per cent. Fat.	Per cent. Fat.	Per cent. Fat.	Per cent. Fat.	Per cent. Fat.	Per cent. Fat.
42	42	42	42	42	42
42	42	42	42	42	42

Cream sent thrice weekly; distance, 3 miles.

1st Week.	2nd Week.	3rd Week.	4th Week.
30, 40, 40	39, 40, 39	39, 40, 39	40, 40, 39

Cream sent thrice weekly; distance, 7 miles.

30, 40, 40	39, 40, 40	39, 40, 39	40, 40, 39

Cream sent thrice weekly; distance, 7 miles.

40, 40, 40	40, 40, 40	40, 40, 40	35, 38, 39

Cream sent 54 miles by train, three times weekly.

40, 40, 39	39, 34, 38	29, 39, 38	34, 39, 38

Distance, 54 miles; twice weekly.

38, 32	41, 33	42, 42	36, 38

Distance, 40 miles; three times a week.

27, 33, 24	28, 32, 28	26, 28, 28	28, 32, 30

Cream carted to factory by town milk supplier nine times per week; distance, 10 miles.

43, 43, 43, 43, 43, 43, 43, 43, 43.

The test remained unchanged throughout the month of January. Factory manager spoke in glowing terms of this dairyman's work.

Cream sent to factory once a day from supplies of two farms 1 and 8 miles respectively from factory.

1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.
38, 38	38, 30	39, 38	39, 39	39, 38

Steady all through the month.

Cream sent by coach 20 miles, thence by rail 60 miles, often arriving in a partially churned condition.

First week—40, 50, 44; delivery thrice.
Second week—48; one delivery, then stops for a time.

February:

Second week—40; one delivery.
Third week—40, 32; two deliveries.
Fourth week—31, 35; two deliveries.

March, with improved weather conditions:

First week—38, 40, 42; three deliveries.
Second week—38, 39; two deliveries.
Third week—40, 40; two deliveries.

At this stage the dairyman goes to another factory because objection was taken to the quality of his supply.

It must not be inferred from these results that cream cannot be sent to our factories in a condition satisfactory to fat percentage and quality of the product. But where carelessness is in evidence the greatest damage is done to cream when

it is consigned by road or rail long distances, and especially in the heat of summer. The following assists to bear out what has been said:—

Supplier 54 miles from factory, who consigns cream thrice weekly showing an even percentage of fat.

1st Week.	2nd Week.	3rd Week.	4th Week.
45	45, 45, 44	45, 45, 45	45, 44

In this instance the supply was large.

Supplier 44 miles distant from factory; delivery, twice a week.

1st Week	2nd Week.	3rd Week.	4th Week.
42, 41	42, 35	42, 42	42, 42

EXPERIMENTS IN THE SEPARATION OF MILK AND CREAM TESTING.

To illustrate the attendant dangers in separating milk on the farm, I give the accompanying results of experiments conducted by Mr. William Smith, manager of the Yangan Dairy Factory.

The machine used was a small hand-power Alpha Laval, and in each test 55 lb. of well-mixed milk was divided into equal quantities and treated separately. No. A was done in June, and No. B in July. All precautions to ensure accurate figures were adopted throughout the experiments. These tests have been worked out in duplicate, altogether 168 samples being treated to ensure a reliable average. Had the experiments been carried out in hot weather, a much greater variation in the fat-reading and weight of cream would have followed.

Test No. 1 shows the marked difference in cream percentage and yield when cream is added to milk. It will assist readers to understand that variation in cream returns takes place when the quality of milk fluctuates from day to day, caused by conditions already explained in this paper.

Milk.	Milk.	Temperature, Fahr.	Cream.	Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb. oz.	Per cent. Fat.
		First Half.		
a 26½	3.8	82	21 10	33
b 26½	3.0	86	2 8	36
		Second Half.		
a 26½	3.8	82	3 8	39
b 26½	3.0	86	2 12	46

To the second half of milk *a* 1 lb. 2 oz. of cream was added from *a*, and then separated. In the case of *b* 1 lb. of cream was added.

No. 2.

Keeping milk over-night to be separated the following morning is shown, in No. 2 test, to affect the reading of the cream. This is principally caused by the development of acid in the milk, and separating at a high temperature when in that condition.

Milk.	Milk.	Temperature, Fahr.	Cream.	Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb. oz.	Per cent. Fat.
		First Half.		
a 26½	3.2	86	2 10	32
b 26½	3.1	90	2 8	26
		Second Half was kept until faintly acid.		
a 26½	3.2	90	2 10	27
b 26½	3.1	90	2 8	22

No. 3.

The addition of preservatives to milk to increase its keeping properties by arresting the activity of lactic acid organisms is illustrated in the even results in fat obtained compared with No. 2. But there is a loss both in richness of cream and weight.

Milk.	Milk.	Temperature, Fahr.	Cream.		Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb.	oz.	Per cent. Fat.
		First Half.			
a 26½	3.6	81	3	4	29
b 26½	3.4	86	1	12	32
		Second Half.			
a 26½	3.6	90	3	2	27
b 26½	3.4	90	1	8	30

To the second half, ½ oz. of "preservative" was added, milk kept for thirty-six hours; separated 90 degrees Fahr.

The preserved cream had a bad flavour and objectionable smell in each instance. This is very important.

No. 4.

The addition of separator milk in the fourth test has not made any difference in the percentage of fat in the cream, although the weight is slightly increased. Alteration of the cream screw is shown to make a well-defined change in the butter ratio of the cream.

Milk.	Milk.	Temperature, Fahr.	Cream.		Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb.	oz.	Per cent. Fat.
		First Half.			
a 26½	3.0	79	1	12	46
b 26½	3.2	88	2	8	36
		Second Half.			
a 26½	2.8	78	1	12	45
b 26½	3.0	86	3	0	36

One quart of separated milk was added in the case of *a*, cream screw of machine was altered three-quarters of a turn to increase percentage of fat and decrease yield of cream. In the case of *b*, the screw was put back as near as possible to its former place.

No. 5.

The separation of milk containing added water has decreased the yield of fat by 2 per cent., but has not affected the weight of cream. It must be borne in mind in tests Nos. 4 and 5 the additions were made to milk. Had it been cream, a much greater change would have resulted.

Milk.	Milk.	Temperature, Fahr.	Cream.		Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb.	oz.	Per cent. Fat.
		First Half.			
a 26½	3.5	80	3	2	26
b 26½	3.5	80	3	2	26
		Second Half.			
a 26½	3.2	80	3	2	24
b 26½	3.2	80	3	2	24

To the second half one pint of water was added. Test of milk dropped from 3.5 *a* to 3.2, and from 3.6 *b* to 3.2.

No. 6.

Forgetfulness is sometimes shown in the proper cleaning of separators, consequently the keeping qualities of cream suffer very severely; also dissatisfaction is met with in the yield of butter fat and weight of cream. No. 6 will demonstrate the danger of not attending to the care of the machine.

Milk.	Milk.	Temperature, Fahr.	Cream.	Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb. oz.	Per cent. Fat.
First Half with Unclean Separator.				
a 26½	3·6	86	2 8	32

The separator was worked in the morning in a dirty condition—not having been cleaned after the previous evening.

Second Half with Clean Machine.				
b 26½	3·6	86	2 8	34

Fat Percentage.

Skim milk *a* slightly less than 0.1 per cent.
Skim milk *b* no trace.

I would draw the attention of owners of separators to the loss of fat in the skim milk, and to observe that the second half of the test showed the virtue of cleaning the separator immediately after working.

No. 7.

Carelessness in turning the separator is responsible for much disappointment by dairy farmers in their dealings with the factory. We have proof of the evil in the figures to follow:—

Milk.	Milk.	Temperature, Fahr.	Cream.	Cream Test.
Lb.	Per cent. Fat.	Degrees.	Lb. oz.	Per cent. Fat.
First Half—Careful Turning.				
26½	3.4	86	2 6	44

No trace of fat in skim milk.

Second Half—Irregular Turning.				
26½	3.4	86	2 8	36

Percentage of fat in separated milk of second half, 0.1. Numbers 6 and 7 were checked several times to ensure reliable results.

In concluding this paper, I might point out that, owing to instruction not reaching the Yangan Factory through some mishap, Mr. Smith did not subject the samples of separator milk to a test for fat by the use of bottles specially made for the purpose. In the last two tests the ordinary milk bottle was used.

The results arrived at in this practical investigation are not conclusive, but are sufficient to instruct dairymen on the subject dealt with. It is my earnest wish that care and attention to the raw produce of the farm be reflected in the manufacture of butter of a higher quality.

PIGS AND THEIR MANAGEMENT.

Some time ago we printed a series of articles under the above heading, which were much appreciated by farmers and others. We now propose to continue the subject, and cannot do better than reopen it with a lecture by H. W. Potts, F.C.S., Principal of the Hawkesbury Agricultural College, New South Wales, which we take from *Farm and Home*. The lecture is entitled—

Australian Farmers Should Breed More Pigs.

It is a matter of common remark throughout Australia that comparatively few of the smaller class of farmers give much attention to pig-breeding. This is difficult to understand, because so little capital is required to start and carry on the business. Pigs cost less than any other kind of stock. The capital required to add pig-raising to the general routine of farming enterprise was small and practically insignificant. With judicious management, the pig made quicker and more profitable returns than any other class of domestic animal, more especially under the favourable conditions existing in this climate, where sunshine and health were invariable accompaniments, and where grazing was cheap and abundant.

The rise and progress of the Danish co-operative bacon-curing factories will be realised from a statement taken from official records. The first co-operative bacon-curing factory was organised and started operations in 1888. In that year 23,407 pigs, valued at £57,000, were killed. The average price paid per pig was £2 9s. The following year eight factories started operations, and a steady increase was observed. In 1902 twenty-seven factories were in full operation; 777,232 pigs, valued at £2,500,000, were killed; and the price per pig advanced to £3 4s. 6d. In addition to these twenty-seven co-operative bacon factories, with a total number of shareholders of 65,800, there were also in Denmark twenty-four private factories. The shareholders of the co-operative factories were under guarantee to supply to the factories all the pigs they produced, failing which they were liable to a heavy fine. The output of the factories was sent to England by their own organisations.

Of late years, throughout the world, as well as in Australia, there had been an almost incredible increase in the consumption of bacon, ham, small pork, and other classes of food derived from the pig. No domestic animal provides a more useful, varied, and tasteful assortment of edible delicacies than the pig. An unlimited market exists for bacon, ham, and pork in Great Britain. England imports annually about 250,000 tons of bacon. The total purchases in 1903, including pork, lard, and other pig products, exceeded in value £26,000,000. Ten years ago England's bill for this class of food was less than one-half that sum. The principal suppliers are Denmark and Canada. In the former country pork-raising had advanced in importance with dairying, and the Danes included bacon-curing with their splendid system of co-operation. It is quite within the range of Australia's means to open up a profitable trade with the mother country in pork and bacon. As her dairying industry becomes more firmly established and increased, so must the trade in pork. It is considered a fair estimate that 25 per cent. of a dairy farmer's income is derived from the pig when the skim milk is used for feeding. In Australia we divide those engaged in pig-raising into five classes:—First, there was the stock-owner, who rears pigs on a large scale, and in which grazing forms the main source of food supplies. Secondly, there is the dairy farmer, who supplies milk for separation for butter and utilises the skim milk for pigfeed. Thirdly, there is the agriculturist engaged in mixed farming, who systematically grows feed for pigs, such as cereals, maize, clover, lucerne, peas, rape, potatoes, &c. Fourthly, there is the suburban pig-raiser and fattener, who purchases the by-products from breweries, distilleries, canning, biscuit, and other factories, flour-mills, abattoirs, hotels, public institutions, &c. Fifthly, there is the householder, who rears a limited number of pigs in styes to eat the waste from the table and kitchen of the home. It will thus be seen what a large number of persons are engaged in this industry.

Apart from the unlimited market available in Britain, there are many unexplored centres of trade in the East and in closer proximity to Australia to be exploited with an article of food which can be so profitably raised, cured, and shipped with so little risk.

Like all other industries associated with the production of foods, the methods of breeding, feeding, and management of late years have undergone a vast change. Those who had failed to keep up to date and make themselves conversant with modern requirements simply carried on the industry in a perfunctory and unprofitable manner, whilst others were prejudiced and disgusted owing to the prevailing slipshod treatment and unpardonable indifference and neglect accorded to the best of domestic animals.

Breeding.

In the breeding of pigs the great object to be aimed at is to produce a large amount of succulent, tender meat, with good texture, strong bones, light offal, prolificness, early maturing propensity, good back, all-round development of fore and hind quarters, clean in habit, a greedy feeder, good handling qualities, a smooth scurfless skin, bright, clean, flexible hair, a good temper, and power to resist disease. Unless pigs were well cared for and handled, properly fed, and improved strains of blood introduced at frequent periods, they rapidly deteriorate and revert to the original type. The pig is an economic animal, seeing that on the farm, dairy, orchard, or garden it utilises waste products which are practically unmarketable and would otherwise be wasted. Australian farmers should now have sufficient experience to indicate the best breeds for their use in this climate. Of black, there are the Berkshire, Long Black, and Poland China; of the white, the large, middle, and small Yorkshire; and of the red, the Tamworth. The founders of these breeds aimed at one special characteristic—namely, early maturing combined with improvement in the quality of the flesh. In securing these, size has been sacrificed. The utmost care has to be observed in avoiding close or in-and-in breeding, the evil results of which are evidenced in a weakening influence in point of robustness and prolificness, and a disposition to disease, especially tuberculosis. The breed to be employed by any farmer must be determined by the demands of his best market as well as the distance from it and the available food supply. Any district would do, provided there are available good soil, water, and shade. Shade is especially needed where the summers are hot, as well as water. Cool situations and plenty of water to wallow in are advantages that could not be overlooked.

The Boar.

Crossbred boar in any district is nothing short of a calamity. Like the bull, a well-bred boar is half the herd in maintaining a vigorous, quickly-maturing, healthy, and prolific race. The animal selected should be keenly studied. The first consideration is pedigree, then an inspection, if possible, of the parents, selecting from a large litter noted for evenness and thrift. When developed the animal should have a good length and depth of body, wide, compact, and firmly set on straight legs of fine bone. A strong muscular development and vigorous constitution is shown in a capacious chest with large girth immediately behind the shoulders, giving ample room for healthy heart and lung action. The head should be wide and deep between the eyes and ears; the eyes bright and lively; the neck moderately thick and deep; the loins wide and thick; the flanks deep and full; a level back or slightly arched; quarters long and straight from hip to tail; hams large, full, wide, and well let down on the thigh; legs straight, fine, and wide apart, with short pasterns, bone flat and fine; skin smooth, clean, fine, and scurfless; hair bright, long, fine, and plentiful; a fine muzzle, easy action, and distinguished carriage, with a general smoothness and symmetry of outline. A special qualification in a boar is the possession of a gentle, docile, and tractable disposition. The embryo teats should be full in numbers and evenly placed, the teats visible and evenly suspended. Boars should not be confined

in a stye or fed on any class of food likely to fatten, otherwise they lose the special vitality needed for their work. If allowed to get fat and lazy, they throw small litters. It is a bad practice to allow the boar to roam amongst the sows. The animal should be at least eight months old before being permitted to serve, and then only a few sows the first season. After eight years' service he should be killed.

The Sow.

The selection of a useful sow with true motherly instincts is a matter of concern to the pig-raiser whether it be for raising stud pigs, porkers, or baconers. It must be borne in mind that the sow furnishes the internal qualities on which digestion depended and the progeny's capacity to fatten as well as fecundity. It is best to commence with young sows or yelts selected from large litters noted for activity, even build, and great vitality. The general outline of a sow was to be fully estimated, the frame should be long and broad, with well let-down hams, compact, though roomy, long quarters, broad loins, good birth, and strong back slightly arched, and fine, short legs. She should be noted for sturdy and robust habits, a kindly disposition, docile temperament, cleanly habits, and have well-formed udders—twelve or fourteen teats, placed equi-distant. She should be narrow at the top of the shoulders and light in the second thighs. The pig-raisers should reject all sows with a tendency to fatten. A good sow should be spare and have all the appearances of a dairy cow, with the disposition to convert her food into milk. A poor suckler is invariably a slow breeder and provides small litters. Yelts should be at least ten months old before they are served. Many farmers assert their preference for "a big, roomy sow," but she might have the points of one unduly enlarged and become ungainly, loose, flat-sided, and weak-loined. These flat-sided clumsy mothers often killed their young in regaining their feet. It is a good sign to see a sow a greedy feeder. Her suckers are more thrifty and active. After service, the sow should be turned into a grass paddock. Many sows are ruined through being overfed. The aim is, to provide health and exercise in the compulsory search for food. Grazing provided the elements for the growth of bone, muscle, and flesh, and, in this warm and generous climate the sow is best grazed until about a fortnight prior to the date of farrowing.

The paddock should not be used for grazing other stock. The animals should be freed of any element likely to create fear, pain, anger, or excitement. Placid content should be looked for. Sows are fond of basking in the sun. It keeps them healthy and contented. Shade and water should be available. Overfeeding is liable to induce premature farrowing and a fractious temper and excitement as the period for littering approached. Moreover, the suckers are likely to be puny and the milking capacity of the mother lowered. When brought in, the sow should be comfortably housed in a clean, well-drained stye, and given light and easily-digested food, such as kitchen slops and washes, pollard, and a variety of green food. If constipation is observed, some laxative food might be substituted, such as bran or a dose of castor oil (a wineglassful) in warm swill. In all cases one should avoid giving food that is likely to induce constipation. After farrowing light sloppy food, all noted for encouraging a full flow of milk, should be given at regular intervals at least four times a day. The chief object is to provide the suckers with an ample food supply through the mother.

The Young Pigs.

The management of the suckers really commences when they are three weeks old, as they begin to supplement the maternal supply. Exercise in the open air and running about in the sun has a marked influence in keeping them thrifty. Ours is a splendid climate in this regard. Suckers have small stomachs, and, in consequence, they should be fed frequently. They should never be allowed to get hungry. It is surprising to note how frequently they suck the mother in twenty-four hours. Weaning could be gradually effected by

teaching the most robust sucker to feed on milk slops and a few grains of peas or maize. It soon learns to eat grass and forage for itself. When sufficiently grown, in from six to eight weeks, suckers acquired sufficient training and confidence to forage for themselves.

The Berkshire.

The Berkshire is the most popular breed in Australia at present. This may be attributed to the facility with which it has become acclimatised in every part of the Commonwealth, to the high returns it provided for both bacon and pork, its great muscular power, vitality, constitutional vigour, and its power to resist disease.

These qualifications, it is to be regretted, were being jeopardised in many places by too close breeding. Pig-raisers are not devoting sufficient attention to the introduction of fresh lines of blood, and the prolificacy of the breed is thus being lowered. The Berkshire is well modelled, has good length, deep flanks, large hams, well-sprung ribs, puts on flesh rapidly, and possesses a captivating and symmetrical outline. Special merit might be assigned to this breed for the character of the meat—its tasty sweetness, its fine texture, and the well-balanced proportions of lean and fat—which makes it a general favourite with butcher, bacon-curer, and consumer. The temper and disposition are all that could be desired. Sufficient attention is not devoted to developing the young frame before fattening off, and there is an apparent tendency to legginess in consequence. The Berkshire could be killed at any age from four to eight months as porkers. The weight most favoured by butchers is from 60 lb. to 90 lb., and by baconers from 120 lb. to 140 lb. When a pig reached eight months old, the feeding per lb. is more costly. The Berkshire is a good grazer and provides a good flesh, well intermixed with lean, and of excellent flavour. It dresses well. The offal is light. The proportion of live weight is 86 to 90 per cent. It is valuable for crossing on grade or other sows, and the prepotency of the sire is readily detected in the litters. The sow is an excellent mother, contented, sturdy, clean in habit, a good suckler, and rears her pigs with great care. She is fairly prolific when served by good boars. In selecting long, roomy sows, some attention should be devoted to the hair as evidence of constitution. If it be very strong, it denotes coarseness of flesh. One should avoid sows short in the body, with little hair and drooping quarters.

Management of Pigs.

With proper management, pig-raising can be a very profitable industry, but, in order to secure the best returns, intelligent care has to be exercised in both breeding and feeding. Pigs respond wonderfully to rational feeding, cleanliness, warmth, and good sanitary conditions. Liberal feeding is an absolute necessity, but the food must be cheap, palatable, sweet, and nutritious, and given at regular intervals.

A young pig, after being placed in the stye to fatten, should gain 1½ lb. per day, and should not cost more than 2½d. to 3d. per lb. to feed. Continuous progress from the date of weaning must be maintained in weight until the animal is ready for the butcher. It must not receive a check. If it did, it never recovered. Pigs weighing 250 lb. require nearly twice as much food for every 100 lb. of increase as those weighing from 40 lb. to 75 lb. Hence the aim is to market as porkers or baconers as early as possible. The quickly-maturing breeds pay best. The prime need is good pasture, water, open air, sunshine, and exercise in the early stages of growth after weaning. Lucerne provides the best green food. On this the young pigs develop muscle, red flesh, nerve, tissue, and bone. Clover is also good fodder. The recently-introduced summer grass, *Paspalum dilatatum*, furnishes a green, succulent, and nutritious pasturage in the summer unsurpassed for its grazing capacity for pigs. Skim milk alone or combined with grazing gives good results. Combined with starchy foods, such as pollard, maize, barley, rye, or potatoes, a perfect food is obtained. Thirty-three gallons of skim milk equal in food value

100 lb. of maize meal. Butter milk is equal to skim milk in pork production. Rape of late years has been found a valuable green crop for pigs. One acre of rape is equal to a ton and a quarter of maize. Peas, beans, potatoes, artichokes, buckwheat, wheat, barley, bran, and pollard are all good foods. From a grazing aspect, the following might be grown on the farm and made available for pigs: Texas blue grass, cocksfoot, prairie grass, couch grass, French clover, berseem clover, crimson clover, lucerne, field peas, beans, cow peas, soy beans, maize, sorghums, millets, rye, linseed, kale, cattle cabbage, kohl rabi, mangolds, beet, swede turnips, pumpkins, vegetable marrows, and vegetables.

Bacon-curing.

Bacon-curing ought to be conducted on every farm. The appliances required are inexpensive, and the methods employed readily learned. To ensure success in curing bacon, the pigs must be rested for some time and starve at least twenty-four hours prior to slaughter. The following observations are worthy of note—1, the circulation of dry cold air and uniform coolness in the curing-room; 2, scrupulous cleanliness in all operations; 3, commence twenty-four hours after slaughtering; 4, choose only meat free from bruises and which has been taken from rested and healthy animals; 5, work in an open and cool place in favourable weather, as the colder the atmosphere the easier it is to cure; 6, after the animal has been cut down and the joint oil removed, the sides trimmed and cleansed, a thin layer of equal parts of boric acid and finely-powdered saltpetre should be sprinkled through a fine sieve over the fleshy portion of the side. This helps to retain the colour. The meat should then be allowed to remain for twenty-four hours, after which the dressing should be rubbed off, and the following mixture worked in dry once each day for fourteen days:—Fine dairy salt, 50 lb.; brown sugar, 5 lb.; powdered saltpetre, 5 lb.; boric acid, 5 lb. All these ingredients must be well dried, finely powdered, mixed, and sieved. After the sides have been cured they should be washed well in pure water, and then soaked in water containing ½ per cent. of baking soda for twenty-four hours. They then should be hung in a well-ventilated room until they are dry, trimmed, and the skin rubbed with olive oil; they then go to the smoke-house. Hardwood sawdust answers best for smoking. The smoking takes from five to ten days. The chief feature to observe is to have the smoke to reach the bacon as cool as possible.

HYDROGEN-PEROXIDISED MILK.

Mr. Ivar F. Witting, graduate of the Alnarp Agricultural College, Sweden, now a resident of Yangan, Queensland, has furnished us with the following account of his invention of hydrogen-peroxidised milk, as given to a representative of a contemporary journal:—

It is past denial that infectious diseases have been spread by milk. We are far from alarmists, and the instances in which milk has been proved to be the vehicle conveying disease germs have been found few; indeed, considering consumption of milk, we may say that they are exceedingly rare.

Nevertheless, it is a fact that milk contains millions of bacteria, some of them the originators of dangerous diseases. All who have examined the impurities thrown out by the process of separating by means of a separator must be struck with the large amount of foreign matter, such as fragments of straw, human and cows' hair, sand, dirt, hayseeds, fœcal matter, epithelial scales, &c.; and it is evident that the presence of all these things affects the wholesomeness of the milk, and introduces and rapidly multiplies germs of disease. To avoid this state of things seems almost impossible when we remember that the cows often are milked by careless people, the cows and the milking-yards are not always kept in a state of cleanliness beyond reproach, that the milk has to travel over dusty roads, and to stand in the close atmosphere of railway stations.

The strong constitutions of adults in good health successfully defy these disease germs in numberless instances, but with delicate infants the case is different. The very highest medical authorities, both at home and on the Continent, lay particular stress on the extreme importance of sterilising milk for infants. In many towns the authorities in charge of hospitals, orphanages, and similar institutions allow only sterilised milk to be used. A large reduction in infant mortality has resulted, and physicians and hygienists are sanguine that, when generally used, sterilised milk will reduce infant mortality in large towns by 50 per cent., most particularly during the summer months.

It is a recognised fact, and the outcome of the most scientific researches, that the mere "boiling" of the milk, and then letting it stand exposed to the air until it is required for consumption, is almost a greater evil than not boiling it at all. The "spores" in the raw milk are often far more numerous and dangerous than the living micro-organisms in it, and the effect which the "boiling" the milk has upon these spores after some hours' standing is that they have been incited to life, and are then absorbed in this even more dangerous state to the human system than if they had been undeveloped.

Pasteurising is a method by which injurious bacteria in milk are destroyed by heating up milk to 185 degrees Fahrenheit, followed by instant cooling down to 40 degrees Fahrenheit. (This latter point is but too often overlooked.) By this method bacteria are destroyed—at least, the less developed specimens. It has been proved that stronger, more developed specimens, and also "spores" resist even greater temperature.

If milk which has been heated up to 185 degrees is allowed to cool down slowly, the bacteria and spores which survived will regain their energy when the temperature falls to 101 degrees—*i.e.*, "optimum" temperature, or the most suitable temperature for bacteria to live and work in. Pasteurised milk *must* be cooled down as low as possible *immediately* after heating, otherwise the result of the previous heating is nil. The temperature is also to a disadvantage from other points of view. If the heating is not carried further than 184 degrees Fahrenheit, the bacteria are *unhurt.* If, on the other hand, the temperature exceeds 186, the milk will get a taste—what is commonly called "boiled taste"—which is far from pleasant. By pasteurising, no doubt, the greater part of the bacteria are destroyed, and such milk is therefore wholesome, but only as long as the air does not reach the milk. The same moment the vessel is opened, the bacteria, which are omnipresent, begin their work in the milk, and the case is as bad and hopeless as ever.

As far back as 1890 scientific men had directed their attention to the disinfecting character of hydrogen-peroxide. At the Medical Congress in Berlin, 1891, results of experiments were published, and showed that cultures of cholera bacilli were killed in a few minutes by the use of hydrogen-peroxide. Since that time but little attention has been given to hydrogen-peroxide as a disinfectant or preservative, though it has been used in the medical profession for certain purposes. Mr. Witting's attention was directed to these experiments, and it appeared to him that good work could be made of hydrogen-peroxide. The importance of destroying the bacteria in milk always was apparent to Mr. Witting, he being a dairy expert; and he at once set about with experiments, which have continued ever since, with varying results. The series of experiments resulted in the discovery that enzymes (enzyme = unorganised ferments, such as ptyalin, pepsin, diastase, and trypsin) in milk, together with heat, have the property of decomposing hydrogen-peroxide into water and free oxide, the fromula being—

$$\begin{array}{c} H_2\,O_2 \\ \swarrow \quad \searrow \\ H_2O + O \end{array}$$

and that at the forming of oxide in *statu nascendi* a complete destruction of bacteria takes place.

Every detail of the process has been worked out carefully by Mr. Witting. Series of experiments have been carried on at the Bacteriological Institute, and Mr. C. J. Pound, Government Bacteriologist, says in a report of the 20th August:—

"It was found that all fermentations by bacteria were at once stopped, and the organisms destroyed; moreover, milk so treated remained perfectly sweet and unchanged for a period of over thirty days."

The following are some figures illustrating these experiments:—

No.	Milk.	Plate Culture taken after—	Number of Bacteria per cc.
55	Control Fresh Milk, not treated	1 day	336,000
50	,, ,, ,, ...	1 ,,	50,560
56	,, ,, heated 2 hours, not treated	1 ,,	66,880
52	Milk treated according to Mr. Witting's process	1 ,,	None
52A	Same as 52	16 days	,,
52B	Same as 52 and 52A	29 ,,	,,
61	Milk treated according to Mr. Witting's process	35 ,,	5
6	,, ,, ,, ,, ...	35 ,,	38
51A	,, ,, ,, ,, ...	21 ,,	20

It has, therefore, been proved that by this method (hitherto called the hydrogen-peroxide method) can be obtained a perfect guarantee that the bacteria, which cause diseases commonly believed to be spread by milk, can be completely destroyed. To this kind of diseases we reckon typhoid, diphtheria, tuberculosis, and anthrax. It has been proved that milk has been kept sweet for at least fifty days, and there is no reason why it cannot be kept for much longer time.

Milk has been sent from Brisbane to the Downs and return per parcel post, and this milk arrived in Brisbane again in perfectly sweet condition.

Hydrogen-peroxidised milk can, of course, be used for all purposes to which ordinary milk is submitted.

The great importance of Mr. Witting's discovery should be quite clear to every mind.

Hydrogen-peroxidised milk is absolutely flavourless and tasteless, and the character or the compounds of the milk (lactose, albumen, fat, and casein) are not in any way affected by the process. Hydrogen-peroxide in itself is tasteless and absolutely non-poisonous; but in the process the hydrogen-peroxide is *absolutely decomposed*, and the new compositions that form after the decomposition—viz., water and free oxide—are tasteless and harmless.

Hydrogen-peroxidised milk is of special use in the medical profession. It is without doubt a splendid tonic.

For Weak and Poorly Nourished Organisms.—As a food for poor and weak and badly nourished children, hydrogen-peroxidised milk ought to be just the thing.

For Acute Stomach and Intestinal Catarrhs.—The suggestion is close at hand that such milk, especially in treatment of these diseases, is the best, if not the only remedy required.

For Chronical Diarrhœa.—Even in this case, the milk should be an unfailing factor.

Stomach Wounds (Ulcus ventriculi).—The treatment at the beginning should be no other food than this milk.

Typhoid Fever.—The chief point in the treatment of typhoid is the diet. Milk is considered the best nourishing food, but, unfortunately, only a few patients can stand milk, and, as a rule, during a short period only. Hydrogen-peroxidised milk should be tried, and there is no doubt it will prove a great success.

The Horse.

THE MULTIPLE ORIGIN OF HORSES AND PONIES.

With reference to an extract from the *Peebleshire Advertiser*, describing the horse-breeding experiments of Professor Cossar Ewart at Penicuik, which we published in the last issue of the *Journal*, Mr. James Moffat writes:—

In last month's issue you publish an account of Professor Cossart Ewart's experimental work in cross-breeding; this, together with his paper published in *Nature* on the "Multiple Origin of Horses and Ponies," as shown by radical difference in skeleton structure, is of much interest to Queensland horse-breeders.

In 1887, I first drew attention in the *Queenslander* of our breeders to the harm accruing to our Australian stock of horse from cross-breeding conformation. At that time I confined myself to the deterioration caused by the use of sires of the inferior type of conformation common to English draught stock, and urged the use of true-typed Clydesdale, as this breed was developed on true Arab lines of conformation—contributing at that time as "Clydesdale."

Ten years later, our thoroughbred stock showing the same deteriorated lines which had been developed in our draught stock, I contributed articles in your *Journal* with the object of getting our horse-breeders to study the subject for themselves, at the same time advocating recourse to Arab blood as the most certain means of reproducing in our horses the virtues lost by the breeders indiscriminately cross-breeding different skeleton structures of the horse.

The studies of Professor Cossart Ewart endorse my contentions and much which I have not hitherto advanced; but for long I have thought it was possible that stringhalt and nerves or shivers may be a result of cross-breeding skeleton structure. One fact which strengthens me in this view is, that I have never known shivers to occur in horses bred true to the old type of Clydesdale; in all cases of shivers in draught stock coming under my notice they have invariably distinctly shown evidences of being crossbred in Shire.

Chinky-back, stringhalt, and nerves or shivers have much in common in the peculiar manner in which they paralyse the action of the hind legs. The reason for this is well understood in chinky-back, the lesions being easily observed. This is not so in the case of either stringhalt or shivers, which as yet are mysterious and not well-understood ailments. But, if anchylosis of two joints of the vertebra can, by causing jar to the spinal cord, produce the peculiar paralysed action of the legs in the chinky-back horse, may not cross-breeding skeleton structure, so different as to vary the number of joints in the vertebra, account for disturbance in the smooth working of the spinal cord nerves in some percentage of the crossbreds, and thus produce the symptoms shown in stringhalt and also in shivers, though lesions to account for the mystery are not to be found?

One outstanding fact which requires no scientist's experiments to demonstrate is, that a large percentage of our stock are "off balance" through being crossbred as to skeleton structure; this is most regrettable, as it renders the stock of little commercial value, and considerably lessens its industrial value to the State, as the action and general efficiency are thus most seriously impaired.

Poultry.

THE POULTRY INDUSTRY.

We have several times pointed out to farmers and others the enormous trade which is carried on throughout the world in poultry and eggs, and have persistently advised that the business of poultry-breeding should be gone into systematically, whether on a small or large scale. Since the Department of Agriculture commissioned Mr. Fern to deliver lectures throughout the country on poultry, we are glad to note that there has been a very marked interest taken in the business, and that better stock is being kept by the farmers, who have awakened to the fact that, as in the case of horses, cattle, sheep, or pigs, it costs no more to keep a good animal than it does to keep a mongrel—perhaps less. Why should a farmer keep mongrel barndoor fowls, which sit half their time and produce chickens worth 1s. 6d. a pair, when by judicious crossing he can, at a trifling expense, rear non-sitting birds or first-class birds of different cross breeds which will bring him in from 4s. to 6s. per couple? Good fowls are just as easy to keep and as cheap to feed as bad ones, and they mean all the difference between 1s. 6d. and 4s. a couple.

To give some idea of the enormous trade in poultry and eggs in the United States alone, we publish a few figures given in the *Florida Agriculturist* lately.

We have, says that journal, at various times quoted from different papers showing that this is an important item in the business of this country. The following combination of estimates shows conclusively that it is the most important branch of the whole list.

The first set of figures is from *Commercial Poultry.*

Some farmers feel that caring for poultry is too small business for them, and turn it over to the "women folks." To satisfy such farmers we will admit that a hen, as an individual, is not a very important factor in the business world, but at the same time we shall boldly assert that the hen, as a class, is one to be reckoned with when considering the prosperity of the United States.

According to the Twelfth Census, there were 250,681,593 fowls (counting chickens, turkeys, geese, and ducks) on the farms of the United States, not counting those under three months old, and as the enumeration was made in June those "under age" would have materially increased the total number. Fowls kept within the corporate limits of town were not considered in the report, and, as the number kept in nearly every town outnumbers the inhabitants, they would have added another big increase to the showing.

Some people ask why there were millions fewer fowls kept in 1900 than in 1890, but the question only shows that little study has been given to the question. It is perfectly true that the number reported in 1900 was very nearly 35,000,000 less than in 1890, but it must be remembered that in 1890 everything out of the shell was counted, whether it was twenty-four hours old or not, and in June that means a vast number.

To show that, under the same rule of counting, the last report would have shown a vast increase instead of a decrease, it is only needful to note that in 1900, with 35,000,000 less fowls reported, there was an increase of 414,095,228 dozen eggs—the total number for the year being 1,293,818,114 dozens.

The highest average price per dozen was reported by Nevada, being 20.8 cents, while the lowest price was reported by Texas, her average being but 7.7 cents. Taking the average price reported from each State and territory for the United States it proves to be 11.15 cents per dozen.

Some statements formulated from the census reports are simply astounding to one who has not kept closely in touch with the commercial side of the poultry question. For instance: The egg product of the United States in 1899

was greater than the combined gold and silver product for any year since 1850, with the single exception of the year 1900, and the poultry product during the same period overbalanced the gold and silver for any year except 1899 and 1900. More astonishing still is the statement that the eggs and poultry combined, for the year 1900, exceed the combined gold and silver product of the entire world for any year since records have been kept (beginning in 1493), excepting the years 1898 and 1899.

Turning to other products for comparisons, we find the reported value of all animal products of the United States for 1899, including all animals sold, wool, mohair, goat hair, milk, butter, cheese, eggs, poultry, honey, wax, &c., to be 1,718,990,221 dollars. Poultry and eggs were estimated to furnish 16.3 of this stupendous amount, while their value for the year exceeded the exports (not products) of all animal products for any year up to 1901.

To get any idea of what this comparison really implies, it must be remembered that, in this connection, the animal products exported include not only meats, but hoofs, horns, bones, bristles, glue, grease, hair and hair manufactures, hides, skins, boots and shoes, leather of all kinds, sausage casings, wool and wool products, and all dairy products.

Another surprising fact is shown by the following figures. An ordinary shipping crate holds 30 dozens of eggs, making 43,127,272 crates needed for the shipping of the 1,293,818,144 dozens produced in 1899. A refrigerator car is a trifle over 40 feet in length, and holds 400 crates. From these figures it is easy to find that 107,818 cars would be needed, and these would make a train 868 miles in length.

Turkeys, geese, and ducks figure largely in the estimated value, as well as the number of fowls reported, there being something over 6,500,000 of the first; more than 5,500,000 of the second, and nearly 5,000,000 of the third.

In another number the same paper goes into the matter of comparing the poultry business with mining under the following title:—

Better than Silver or Gold Mines.

We have a habit of doing considerable boasting about the production of silver and gold in this country, and are very proud of the fact that we dig out of our mines more of these precious metals every year than is produced by any other nation on earth.

Notwithstanding this fact, we have in our poultry-yards a source of wealth greater than all that dug from the gold and silver mines between the two oceans. The production of eggs is steadily increasing, and the *Produce and Fruit News* recently gave some figures that will interest all those who are producing commercial poultry, and they are numbered by the million in this country.

America leads all other nations in its poultry and eggs, and the industry is yet in its infancy. Each year it grows, and as rapidly as the cold storage plants have increased there are not enough to accommodate all the eggs and poultry.

It has not been many years since the art of preserving eggs by refrigeration has been in vogue. Last spring and through the summer about 4,000,000 cases of eggs, of 30 dozen each, were stored. These eggs cost more than was ever paid before, and as a season the profits are the greatest in the history of the egg trade. So high have eggs gone that the farmers of the entire country are holding large quantities of hens for the spring lay, and dealers look for an increase in egg production next year of fully 20 per cent. over this. Such a production does not necessarily mean cheap eggs. The consumption has become enormous, and it now looks as though a 20 cent storage egg market can be expected. It is dangerous to figure on anything above 20 cents. The average cost of storage eggs at seaboard this year out of the coolers is 17½ cents. When sales have been numerous at 26 cents, with a prospect of the price going higher, some idea can be formed as to the profits. It is feared that these profits may cause wild buying next spring, and if the crop is what it now promises there may be some heavy losses. The entire egg deal is almost a weather proposition.

The poultry industry is of so much importance that the Agricultural Department of the Government has been investigating with a view of bettering the conditions. It has been shown that the poultry and eggs raised in the United States are annually worth more than all the silver or gold produced in the world during the same time. Secretary Wilson believes that large profits are to be made by those who will take up the business of producing chickens along scientific methods. He knows numbers of instances where men have gone into the industry on a small capital, and, by paying careful attention to the work, have made comparatively large fortunes. According to the latest tables, the value of all fowls on farms is 85,794,000 dollars (£17,158,800). About 15,000,000 dollars (£3,000,000) is deducted from this sum to represent the fowls under the age of three months. The estimated number of chickens in the country is 250,000,000, producing for market in one year poultry worth 136,000,000 dollars (£27,200,000) and eggs worth 144,000,000 dollars (£28,800,000), a total of 280,000,000 dollars or £56,000,000. This represents an income of 400 per cent. on a similar investment. . . . Last year 1,290,000 dozens of eggs were produced in the United States. This allows for the consumption of 203 eggs by every man, woman, and child in the country during that year, and makes the value of the eggs, per capita, 1.80 dollars (7s. 6d.).

Except for the year 1900 the egg product of the United States has exceeded in value that of the combined gold and silver output of the country for every year since 1850. The same is true of the poultry product, except for the years 1899 and 1900.

Pursuing the comparisons further, it is found that the poultry and eggs of 1900 outvalued the total exports of animals and animal products during all the years down to and including 1900.

It seems rather strange that the value of the wool produced here, which is a matter of much concern in the commercial world, and over which many a political battle has been fought, is only about one-third that of the value of the egg product, and who ever heard of a presidential election that was fought on the issue of a duty on eggs?

The poultry and egg products of the United States in 1899 exceeded in value the wheat crop of twenty-eight States and territories. There were produced on the farms of this county in 1899 1,290,000,000 dozen eggs. This amounts to 43,127,000 crates of 30 dozen each. An ordinary refrigerator car, which has an average length of about 42½ feet, holds 400 crates. All this means that a train of these cars, sufficient to carry the product of 1899, would be 868 miles long, or long enough to reach from Chicago to Washington, and have several miles of cars to spare.

Magnitude of Poultry Industry.

The census figures of 1900 reveal the magnitude of the poultry industry. The *New York Sun* has made an exhaustive investigation of these statistics, and announces that there were then 235,598,005 chickens, and they produced 1,293,818,144 eggs, so that a train of ordinary refrigerator cars containing our entire egg crop of that year would have extended from Chicago to Washington, with several miles of cars to stretch along the track toward Baltimore. In 1901 the receipts and consumption of eggs in New York city were 2,372,500 crates of 30 dozen each. Chicago has given even a larger per capita consumption, or an average of 1,581,545 crates a year. When we consider it in connection with the broilers, spring chickens, tough and tender, and roosters we consumed, the poultry interests assume prodigious proportions. The total value of the poultry and eggs we produced in the last census year was 281,178,427 dollars. The industry was worth more than all the cattle and hogs we slaughtered. It was worth more than the wheat crop of twenty-eight States and territories, and the value of our eggs alone was higher than that of the gold and silver product of the United States in any year since 1850, except in 1890, when the precious metals exceeded the eggs by 9,418,125 dollars. These are surprising statements, but they are true, if the census figures from which they are taken are correct.

The following from the *American Cultivator* confirms all these estimates:—

Importance of the Hens.

It is estimated that the production of chickens in the United States last year reached 3,350,000,000 and of eggs 13,000,000,000. The total value was 290,000,000 dollars. The true importance of the poultry business will, however, be better appreciated by the following comparisons:—Our annual wool clip is about 28,000,000 dollars; sheep, 65,000,000 dollars; swine, 180,000,000 dollars; cotton, 250,000,000 dollars; wheat, 227,000,000 dollars; tobacco, 45,000,000 dollars; potatoes, 80,000,000 dollars; barley, 30,000,000,000 dollars; oats 200,000,000 dollars.*

How does Queensland stand in the matter of poultry? In 1903, there were 640,747 fowls, geese, turkeys, ducks, &c., in the State, and 1,891,481 dozen eggs were produced, which would allow for the consumption of about 45 eggs by every man, woman, and child during the year. The total number of fowls in the United States may be represented by three fowls per head of the population. The number for Queensland represent $1\frac{1}{4}$ fowls per head. South Australia, on the other hand, exports eggs to an annual value of over £108,000.

REARING TURKEYS.

Many people will not attempt to raise turkeys, because they say they are too delicate and require too much attention. In some of the grandest districts for raising turkeys, such as the high scrub lands about Forest Hill and Laidley, people are afraid to breed them because of the native dogs, hawks, carpet snakes, &c., which frequent the scrubs. Yet here there is a great store of ideal turkey food in the shape of land shells, which may be seen in hundreds about the scrub turkeys' nests. Insect food such as the soul of the young turkey delights in is abundant. Where reasonable care has been exercised, turkeys of great excellence have been safely reared in these districts. All that is required is to restrain the rambling propensities of the young birds. When they have become strong and sturdy there is not much fear for them. As to rearing them, they are really no more difficult to deal with than common barndoor fowls. Turkey hens very soon become broody, and, having laid about ten or one dozen eggs, will want to sit. Let her sit, but give her no eggs. Keep those first eggs in a box of chaff. Set them on end, and turn them every two or three days. In a day or two after the hen has begun to sit, take her off the nest and put her down on the bare ground, the barn floor for preference; do not give her much food, and she will very quickly begin to find out that plenty of food is preferable to sitting like the famous Alexander MacStinger on a cool floor, so she abandons her broodiness and starts laying again. When she has laid her second dozen she may be allowed to sit. It is when the young poults come out that they want careful attention for about twenty-four hours. As the hen will not have had to cover more than nine or ten eggs, there will probably not be quite as many poults hatched, but, whatever the number, it may take a couple of days before they are all out. This is the time when a little attention is required, but the amount of coddling indulged in by some poultry-keepers is not only useless but often injurious. They want to make the poults eat almost at once. Let them alone for a bit till they are quite dry and can stand a little exposure. The hen will let you know when it is time to feed them. When they are able to feed, give them hard-boiled eggs chopped very fine, mixed with a little very finely-chopped lettuce leaves. Later on, mix in a little oatmeal. They should not get what the womenfolk think as good for all poultry—namely, soaked bread or chopped meat. Time enough for this when they are about a month old. Keep up the vegetable diet. Turkeys have much of the wild fowl

* Dividing these figures by five will give roughly the values in standard money.

about them, and are fond of green food, which suits their constitution. In England, the dandelion is the chosen green food for poults, but we have only seen the English dandelion growing at Brookfield, near Indooroopilly, where it was introduced by Mr. Jackson, of Taringa. So we must be satisfied with as good a substitute as we can get—that is lettuce—which, in the old country, would not be given them until they are some weeks old. After four weeks, push them on a little with buckwheat, ground maize, and such like. As they grow up they will do a great deal of foraging for themselves, and are especially useful in orchards and tobacco fields. A flock of turkeys is worth a dozen hands in the tobacco field for picking off the caterpillars which invariably attack the leaves of the tobacco plant. Turkeys should never be shut up. Keep the hen in a coop in a warm sheltered place, perfectly dry underfoot, for about a month. After that, either move her into a larger coop, with an open-air run in front for the poults, or let her out with her brood. They should not be allowed to be exposed to heavy rains when young, but a slight shower will do them no harm. We should like to see many more turkeys reared on the farms, for they pay well, and are not costly to keep.

NEW TOBACCO PLANT.

A Southern journal says that the cultivation of a superior class of tobacco plant is now engaging the attention of tobacco-growers in the Tumut district, where a high reputation has been gained for the superior quality of leaf of a coarse kind that has for years past been produced. The Chinese, who have been the principal growers, have estimated their crops not by quality but quantity. A Sydney manufacturer has, with successful results, distributed among growers a large quantity of Hester seed, a new kind of superior quality.

The Orchard.

CO-OPERATION IN FRUIT-GROWING.

We have received from Mr. W. Main, secretary of the Runcorn and Sunnybank Agricultural Society, the following paper, read by Mr. J. T. Walker before a meeting of the society on the 18th July. We are always pleased to receive and publish instructive papers read by members of the various agricultural and other societies in the State, in order that all may know what each is striving to do for the benefit of their own and other districts. The following paper will doubtless be read with interest by fruit-growers in all parts of the State:—

Co-operation in Fruit-growing.

A paper read by Mr. J. T. Walker at a meeting of the Runcorn and Sunnybank Agricultural Society, 18th July, 1904:—

We are constantly being reminded of the many difficulties a fruit-grower has to contend with. Fruit-growing is by no means a difficult business, but to dispose of the produce at a fair price is another matter, although we produce as fine fruits as are produced in the world. But why complain about bad markets when we make them bad ourselves?

There is little doubt that, with a well-regulated market, the supply is perhaps not in excess of the requirements; but we are daily brought face to face with the fact that the markets are over-supplied, while, on the other hand, some centres are left short. Supply and demand are ever the same. It is the old story—depending solely on the distribution of products; and, until the fruit-growers combine for the purpose of regulating the supply, the evil will never be remedied. Individually, nothing can be done, and growers must continue playing the game of cut-throat. We are much in the same position that California was in some years ago with prune-growing. This industry was completely at a standstill, on account of bad markets, until they devised a means of co-operation, and since then the industry has gone ahead by leaps and bounds. Since the inception of the co-operative movement, about ten times the quantity is grown, and at a profit. Can that be said of our last year's fruits? No. Well, I think the sooner we start a co-operative fruit-growers' union the better. I have not got the detailed account of the method of working co-operatively in California, so I will suggest a plan of my own. If, for instance, we had a central receiving depôt, say at Pinkenba (I select this place—firstly, because the Government have a reserve there consisting of some 86 acres); we might, perhaps, be able to get a small piece of this land to erect the works upon. Secondly, because any of the oversea boats can call there, and this would save a lot of handling.) This central depôt to be divided into three departments—namely, (1) receiving depôt; (2) preserving works; and (3) an intelligence department. The duty of this department would be to gather reliable information as to the state of markets from all parts of the world, and also the prospect of crops everywhere. These would be summarised and printed in a bulletin, and sent to anyone applying for them. In this way we could have not only a wide but a very reliable range of information.

The preserving works would consist of canneries, &c., to deal with the overplus of fruits for local consumption. When you consider how many jam factories are at work in Brisbane alone, I don't think we need be afraid that this would not pay. The larger a business is, the less the proportionate cost; so, if these small concerns are paying, I should think that one only would pay proportionately better. Now, as to the receiving depôt. The duty of this

department would be to receive the fruit and grade it into, say, first, second, and third grades. Each member would then be paid according to quantity and quality. The produce then becomes the property of the union, to do what it thinks best with, just the same as selling to any private concern. Only a strict account must be kept of each transaction. The fruit having become the property of the union, it would lie with the manager to dispose of it to the best advantage, and, having such a quantity of fruit to grade from, he could place his wares on markets with greater confidence and with better results than the single individual can do. In fact, the brand would be sufficient guarantee. The trouble with the individual fruit-grower is that, although he may be able to supply a certain amount of good fruit, he cannot, very often, keep up quality; therefore he spoils his own market.

Now, as to financing such a concern. No doubt we should want some money to start it. I believe the Government would just be as ready to assist us fruit-growers as they were to assist the sugar-growers, the butter factories, and creameries. No doubt they would want some guarantee, but I think we could give as good as any other factory could give. There must be at least 1,000 fruit-growers—within the Brisbane district, that is—who would make Brisbane their oversea port. If we make the shares, say, £5 each, that would be £5,000; and if the Government gave us £ for £, this would total £10,000. I think that sum would start us in a small way; in fact, I think it would meet all requirements for the present. I should suggest that we make the cost of membership of this union as lenient as possible to small growers or to persons wishing to join, who may not be able to pay a £5-note down. Let the fee be 1s. to join, and the rest be made up in stock or half-profits—a shareholder to only hold one share, and to have one vote; the shares not to be transferable. I say that because, if any persons could deal in these shares or hold more than the one share, then they would soon be in the hands of brokers, perhaps, and it would be a co-operative concern only in name.

On delivering our fruits at the central depôt, we would be paid a nominal price—say 70 per cent. of the value of the raw product; the payment of the balance to be deferred as a safeguard for working expenses. Thus, by dealing direct, we would save the present middlemen's expenses. That, with the deferred payment, would constitute the profits, less expenditure; the profits to be divided according to the quantity of fruit each grower sends in. The books of this depôt could be balanced, say, monthly, and the dividend paid quarterly. These dividends need not be drawn unless the shareholder wishes to do so, but simply left to accumulate, the union allowing the shareholder the same rate of interest as the Government Savings Bank. This is done in the old country, and is a great blessing to a good many people; the limit on which any one shareholder can draw interest to be £200.

There may be some who, for different reasons, would not join in a concern like this, and may derive as much benefit from it as those who do join it. To meet these cases, I should suggest that we follow the decision arrived at by the late fruit conference, and place a tax on all fruit lands; such tax to be 5s. for the first acre, and 2s. 6d. on each additional acre; this fund to be used by the union for developing fresh markets, paying the redemption money, or forming a general sinking fund. I think money so spent would be well spent; better than spending it trying to catch the fruit fly and other pests, as was proposed at the fruit conference. If we can best the middlemen pest, I think we should be able to manage the others right enough. I propose the management of this union shall consist of a manager, five directors, and a subdirector in each fruit-growing centre; the subdirectors to be elected by the fruit-growers in their respective districts for the purpose of collecting and disseminating information to and from the directors or the manager, their post to be honorary; the directors to meet, say, quarterly, to authorise payment of dividends and to discuss matters generally relating to the business of the union and its welfare, also to report these discussions to the subdirectors, who in turn can place them before the fruit-growers in their districts. The

manager must have sole control over the works, and have a free hand in selecting his employees. Great care must be taken in the selecting of a manager, as this is the most important part in the whole business. He must be a man who is a successful fruit-grower himself—one who would throw himself heartily into the work to try and make a complete success of it.

I submit this rough outline, as I believe all fruit-growers believe in co-operation, more or less, though they may honestly differ in the details. Therefore, I beg to move the following resolution:—"That this society believes in the principle of co-operation, and agrees that a committee be appointed to fully discuss this question; the resolutions arrived at to be sent to each fruit-growing centre for approval or otherwise."

DWARFING FRUIT TREES.

J. B. Brewer, writing in the *Farmer and Grazier* on 10th June, says:—

A further frequent mistake is to grow tall trees—up out of the way of the horses, it is usually expressed—so as to cheapen the cost of tillage. This is a point in its favour, and the only one, and it is far outweighed by the many against it. When trees are grown tall they are specially adapted for catching the wind, and every time it blows more fruit falls, until by harvest time frequently from 50 to 75 per cent. is lost, and what is left requires so much climbing to gather that the profits are largely swallowed up, and the tree materially injured by the breaking of fruit spurs and laterals.

A dwarf tree will produce as much bloom and set as heavy a crop as a lanky one, and will carry a much larger percentage of it to maturity; the cost of harvesting is materially reduced, and is performed without damage to the tree. Another point in favour of the dwarf tree is that the foliage protects the heavy limbs and trunk from the burning rays of the summer sun, and shades the ground on which it stands, thus assisting to keep the root system cool and moist. If this system is followed out and the tree kept well balanced and open, a much better crop will result.

FRUIT CASES.

Mr. Daniel Jones, of the Agricultural Department, has furnished the following particulars of fruit cases which have recently arrived from California:—

Grape Cases.—Inside measurement, 16 by 16 inches, 5 inches deep; 8 strips, 1½ inches wide by ¼-inch thick, are spaced so as to construct the bottom and sides of the case. The lid consists of 2 pieces of ¼-inch by 8 inches, with 2 strips 17½ inches by ½-inch across the ends. This case holds about 20 lb. of grapes.

Plum Cases.—16½ by 12 by 4 inches inside measurement. The ends are made of ⅝-inch thick wood, the sides of ¼-inch stuff, with 4 holes ¾-inch in diameter bored in each piece.

The fruit is placed in card sections of 54, with 1¾-inch spaces, two layers of fruit in each box. Between each layer is placed a perforated card-cover, having 4 ¼-inch square strips fastened to it to prevent contact between the upper and lower layers of fruit. This case carries 108 plums held in the section, with no contact with any other fruit.

Tropical Industries.

THE MEXICAN BOLL WEEVIL—ITS POSSIBLE EXTINCTION.

Whilst the boll weevil has not made its appearance as yet in cotton-fields in Queensland, it does not follow that it may not, in time, gain a footing here. It is, therefore, matter for congratulation that the probabilities are greatly in favour of a beneficent insect, a deadly enemy of the boll weevil having been discovered in Guatemala by O. F. Cook, botanist. Although a greatly increased output of cotton from the United States would be the ultimate result of the work of this insect, and consequently prices for the raw material might be much lower than at present, cotton-growers all over the world will not withhold their expression of pleasure at the relief which is possibly in store for our American brethren. The *Florida Agriculturist* has the following on the subject:—

There has been a growing fear throughout the cotton belt that the boll weevil, like the potato bug, would spread gradually but surely until they covered the whole territory. The latest news is, however, that ants have been found to be an effective enemy. The following from the *Farmer's Voice* gives the particulars:—

There is strong likelihood that a representative of the United States Department of Agriculture has discovered the natural enemy and sure destroyer of the cotton boll weevil. O. F. Cook, botanist, during a tour of investigation through Guatemala, found a large reddish-brown ant, which appears to have been created for the special purpose of ridding the world of this pest, so destructive to the cotton in our southern fields. Of this new friend of man, Mr. Cook writes from Guatemala, under date of 11th May:—"The ant's mandibles are large enough to grasp the weevil around the middle and pry apart the joint between the thorax and the abdomen. The long flexible body is bent at the same time in a circle to insert the sting at the unprotected point where the beetle's strong armour is open. The poison takes effect instantly; the beetle ceases to struggle, and with its legs twitching feebly is carried away in the jaws of its captor. As with many other insects when stung by wasps, the paralysis is permanent, for even when taken away from the ants the beetles do not recover. The adroit and business-like manner in which the beetle is disposed of, in very much less time than even the briefest account of the operation could be read, seems to prove beyond question that the ant is by structure and by instinct especially equipped for the work of destruction, and is, in short, the true explanation of the fact that cotton is successfully cultivated by the Indians of Alta Vera Paz in spite of the presence of the boll weevil." If Mr. Cook's conclusions be correct, and the ant may be naturalised in this country, the value of his find never can be estimated in dollars and cents. It will be a triumph for the department, and a blessing to mankind beyond calculation.

It is a striking coincidence that simultaneously with the publication of Professor Cook's letter from Guatemala comes, under date of 31st May, the following despatch from San Antonio, Texas:—Jose Cassiano, ex-county collector, who has several hundred acres of cotton in this county, is the bearer of good tidings concerning the work of red ants. Mr. Cassiano's fields less than a month ago were filled with boll weevils. To-day, he said, there was not a live weevil in his field. The rows are strewn with dead, which the busy little red ants are carrying away by thousands. Mr. Cassiano says a close inspection failed to show a single live weevil on a cotton plant anywhere in his fields. The ants are on the plants and the rows between, in countless thousands. They seem to have completed the slaughter of the weevils, and are now engaged in carrying the bodies away, probably to be stored for food.

SISAL FIBRE AT BUNDABERG.

Remarks by the Hon. Angus Gibson, M.L.C.

When presiding at the lecture on sisal fibre delivered at Bingera last month by the editor of this *Journal*, the Hon. Angus Gibson made some remarks which should afford much food for reflection to farmers and all who are interested in the welfare and progress of agricultural industries. He commented upon the precarious market existing in the Commonwealth for such products as maize, potatoes, hay, root crops, &c., and showed how absolutely necessary it was for farmers, and even for sugar-growers and dairymen, to occupy a portion of their land with some crop for which the world's markets are open. The usual crops grown on the farm, unless turned into butter, cheese, bacon, and hams, are unprofitable during seasons of plenty, and, in any case, have little if any value as exportable products. There were several products of the soil which were marketable all over the world, for which there was an unlimited demand. Such were cotton, flax, and other fibres, amongst which was one—sisal fibre—which was an especially useful plant for the farmer or sugar-planter, in that its habit of growth was such as to render cultivation of the land producing it almost unnecessary. Another good feature was, that it could live and thrive during droughts which would be destructive of almost all other plant life, and hence was independent of rainfall. A further point in its favour was that it thrives on land so barren, rocky, and dry that no other crop could possibly be raised from it. There were many spots on farms where the soil was of this character, and there were fields which had become exhausted owing to continuous cropping with sugar-cane, and which could only be brought back to fertility by heavy manuring, deep ploughing, and plentiful irrigation. These means were not at the disposal of everyone, hence a cogent reason for planting such lands with a plant which was independent of any such extraneous aids to its productiveness. Once the land was laid down in sisal hemp, it required so little attention that the farmer was at liberty to devote all his energies to the production of other crops, and when, at the expiration of three or four years, the crop was ready to be harvested for the first time, the plant was so accommodating as to await the leisure of the grower without deteriorating in the slightest degree. The machinery required for extracting the fibre was simple and cheap, and those who planted only small areas of the *Agave rigida* could co-operate to purchase a machine which would be equal to taking the crop off 100 acres. The demand for the sisal fibre was, he said, unlimited, whilst he was informed that the supply could not keep pace with the requirements of the rope and twine works of the United States and Europe. If they considered the enormous numbers of reapers and binders used by the growers of the 6,000,000 acres of wheat in the Commonwealth and by the wheat-farmers of the enormous wheat areas of America, Asia, and Europe, they would be able to form some idea of the very large quantities of binder twine required, and the whole of this twine, or, at least, a very considerable proportion of it, was made of sisal fibre. Only last month a large shipment of sisal fibre, rope, and twine, amounting to nearly 1,500 bales, had arrived in Brisbane by the Aberdeen liner "Marathon." All this could be produced in the State. Two thousand tons per annum of Queensland-grown sisal fibre would always find a ready market in Melbourne, and there were other States where rope and twine makers would be glad of a supply. He had pointed out these features connected with the industry in order to show what possibilities there were for the future in this direction. Prices for the past seven or eight years had gradually been rising from £16 10s. per ton to as much as £43 per ton. The present price was from £37 to £40. Seeing that the cost of production and marketing of the fibre did not amount to more than 40 per cent. of the market value, they could easily see that there was no other farm crop, perhaps not even sugar, which would give such large profits per acre as this sisal fibre. He intended planting as much land with it as he could obtain plants for, and he understood that others were preparing to do the same, utilising the so-called exhausted sugar lands in this manner.

These remarks coming from so successful and enterprising a sugar-planter as Mr. Gibson cannot fail to carry great weight, and we certainly emphasise the honourable gentleman's advice to plant up the waste places of the farms, and so giving them a money value which they never before possessed. As to the exhausted sugar lands, the labour and expense of restoring them to a good state of fertility would, if properly carried out, amount to between £5 and £7 per acre. Such an outlay is, in many cases, quite impossible, and, consequently, the choice lies between abandoning the land or putting on it some crop which will thrive and give good returns under conditions unfavourable to any of the usual farm crops. This is found in sisal fibre. It should, however, be borne in mind that this plant will not thrive properly on low-lying undrained land, where water lies stagnant. Neither will it be a success on pure sand. It is a rock and a sun plant, and does best on well-drained or on naturally dry soils abounding in lime, potash, magnesia, and phosphoric acid.

There is an immense area of waste land—"wallum" country—lying between Maryborough and Bundaberg and extending to the sea-coast. It has been proposed to plant this with sisal. If the land were found suitable to the culture of the plant, it would doubtless be an excellent venture, as the land lies perfectly level, could easily be drained, and the clearing off of what timber there is on it would be a comparatively trifling business. It has, however, not yet been demonstrated that the soil of this region contains the necessary constituents in the shape of plant food as given above, and, until this is done, it were folly to enter upon the business here on any large scale. Some plants were put in two years ago on this country, near the sea-beach, but they have not shown any growth during that time; indeed, one small plant, 8 inches high, sent out a sucker from its roots—a proof, if any further evidence were wanted, that the plant, small as it was, was at least half-way, if not more, towards maturity. We have, however, been over this wallum country, and have taken samples of the soil and subsoil. These samples are being analysed, and the analysis, when completed, will be published in the *Journal*. We trust that it will prove the soil to be suitable for the sisal plant, as, if so, it will give a value to these dismal-looking solitudes which they have only had during the great drought, when thousands of starving sheep and other stock were kept alive on its shrubs, of which there is a very voluminous growth. As the North Coast Railway line passes through its whole extent, there would be rapid and cheap means of transport for the product from the farm to port.

The analysis of the soil alluded to is just to hand, and shows that it does not contain a single constituent required for the sisal plant. It contains over 97 per cent. of insoluble silica.

If space permits, we shall publish the lecture (or portion of it), which was delivered at Brookfield, Childers, and last month at Bingera Sugar Plantation, Bundaberg.

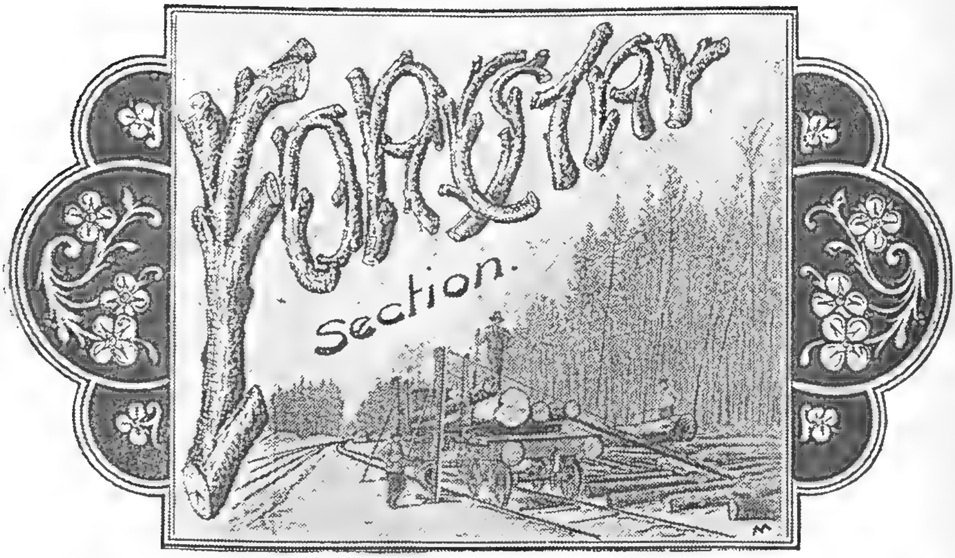
WILL THE SISAL PLANT BECOME A PEST?

Until the nature of the *Agave rigida*, var. *sisalana*, and of its congeners, the *Agave americana* and *elongata*, also of the various kinds of Furcreæ, which are similar in appearance to the Agaves, but do not belong to the same family, and the habit of growth and increase of these plants are thoroughly understood, there will always be a suspicion amongst the farmers that the plants will become a pest similar to lantana, *Sida retusa*, Noogoora burr, nut-grass, and prickly pear. We propose to show that in no way can the cultivation of the Agaves result in the introduction of a pest. The true pests abovenamed are formidable owing to the fact that, with the exception of nut-grass, which is propagated by means of the hard root tubers, all are disseminated by means of seeds, cuttings, and leaves. The seeds are eaten by birds and stock; the prickly pear seed, in the Western country, principally by emus. By their means the seed is carried to long distances, and, germinating when reaching the ground, gives rise to fresh trouble in hitherto clean districts. In the case of the prickly pear, a single leaf thrown on the ground will send out numerous roots from its

under side, and new plants will sprout from the upper. If the leaf be then turned over, the process is repeated. Thus it will be seen what a formidable pest we have in the prickly pear. The lantana is also propagated by seeds in the same manner, and also by pieces of the vine or bramble. This much may, however, be said in mitigation of the lantana nuisance: The copious fall of dead leaves, vines, and fruit enriches the soil to a surprising degree, giving rise to a thick layer of humus, the parent of nitrogen. Once the lantana is cleared off the land, a rich soil remains. *Sida retusa* can easily be got rid of by repeated ploughing and cultivation. It has some use as a fodder plant when young and succulent in dry seasons. Thus stock have thriven on it when no other food was available. It contains a very valuable silky fibre, and it was for the purpose of being grown as a fibre-producing plant which induced the well-meaning but mistaken botanists of forty years ago to introduce it to the colony. For Noogoora burr we have no mitigating circumstances to adduce. It is a veritable useless pest. Neither can we say much in favour of nut-grass, although there are horticulturists who declare that it is of great value in loosening and aerating the subsoil, and that it does not at all interfere with the proper growth of other plants. We should, however, much prefer to loosen and aerate the subsoil by means of implements, and to see our crops kept clear of weeds, which cannot be done where the nut-grass is rampant. Pigs are said to be fond of the nuts, and will clear the land of the pest in course of time by rooting for them, but pigs are not desirable in a garden or among field crops.

The sisal plant cannot be disseminated by its seeds being carried off by birds, because it has no seeds in the usual acceptation of the term. When the plant sends up its flower pole, the latter has several branchlets at its head which bear hundreds of flowers. When the flower falls, a small plant called a "bulbil" makes its appearance. This has from four to nine leaves, and usually remains on the stem until it is from 3 to 6 inches long. No bird ever touches either flower or bulbil. An emu even would think twice before swallowing one. But even were it to have the temerity to do so, the bulbil would be digested like any other soft vegetable, and nothing would be left to germinate. Again, the leaf has nothing in common with the cactus. The Agaves and Furcreæ are not Cacti, and their habit of growth and behaviour under certain circumstances are entirely different. The aloe leaf thrown on the ground will shrivel and die. It has no power of throwing out roots. The plant reproduces itself by means of suckers from the roots, in the same way as the pineapple plant is reproduced, and also by the bulbils formed on the flower pole. When these latter fall to the ground, not one-twentieth part of them will survive even after striking root. This is proved by the numerous plants of different varieties of Agave and Fourcrea which are to be met with in many parts of the State. Nowhere have these plants spread when growing wild for years. How much less will they do so when cultivated and looked after with a view to a crop of fibre? The plants are set out 8 feet apart everyway. The suckers, which appear after the second year, are easily removed with a small long-handled Dutch hoe. These suckers are of value for future plants, and should, together with any bulbils which may be produced, be placed in a nursery and raised for future extension of the plantation.

Only such plants as are required for the purpose of reproduction are allowed to flower. All other poles are cut off as soon as they are 3 or 4 feet high. The plant dies after the bulbils have fallen, and is easily removed. The cutting of the pole gives the plant one more year of life. The bulbils can be swept up with a broom or may be raked up, or in rough rocky ground may be picked up. In the case of an abandoned plantation where the plants may pole unchecked, the bulbils will eventually form an impenetrable thicket, although the harvesting of the leaves can still be proceeded with. There are, however, few if any cases of the aloe spreading to adjoining country. Thus it will be seen that the sisal plant is not, nor has it ever been, a pest in any country in which it has been growing for the last 800 years. On the contrary, it is one of the most valuable plants given to man by the Creator, and as such it should be cherished and cultivated by all farmers.



Conducted by PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

THE FOREST.

(A Preliminary Lecture delivered to the Students of the Queensland Agricultural College.)

By PHILIP MAC MAHON.

The interest which the subject of forestry has for an assemblage of young gentlemen engaged in the study of agricultural and pastoral matters is twofold: firstly, as forestry busies itself with the limited areas of the farm, the run, or the station, the growth of trees thereon, their choice, planting, protection, growth, thinning, and final utilisation, and also with the preservation, so far as may be desirable, of the trees already existent, whether for timber supply in the near or far future, for the protection of the land and of the cattle from the effects of cold winds, and other purposes; and, secondly, as it busies itself with the general forest area of the State, and seeks to utilise to the best account the existing forests, and, if necessary, to create others, having in view the maintenance of a sufficient area of good forest consistent with the demands of settlement; to preserve the natural climatological balance of the country, to ensure an unfailing supply of timber of the best class for industrial purposes, and to provide a revenue not only sufficient to defray all expenses in connection with the improvement of the forests and the cost of its own collection, but to leave a profit substantial in proportion to the area dealt with, the value of the produce obtained, and the degree of development attained to.

The former is private forestry, and the latter national forestry. The growth of individual trees for the purposes of ornament is a branch of forestry known as arboriculture, and the tending and management of woodlands on the extended scale alluded to above is particularised by the title of sylviculture.

At the present day it is calculated that about one-tenth of the area of the globe is covered with forests, an area which is rapidly diminishing. Formerly, there can be no doubt that a much larger proportion of the earth's surface was under forest. It may be interesting here to briefly sketch the behaviour of man to the forests. Man first emerged from the forest. It was his home and shelter. Timidly and tentatively he made settlements on the edge of the jungle, and went through that period of social evolution which, in the works of travellers, we find so vividly pourtrayed as being in operation amongst the

tribes of Central Africa at the present moment. When his position became secure, there came the period of destruction. The forest which had sheltered him became an encumbrance. It was a hindrance to his pastoral occupations, and it afforded shelter to his enemies and the savage animals which played havoc amongst the herds of animals which he had succeeded in weaning from their wild life and pressing into his service. Fire was his chief servant in the work, which was also expedited by the feeding of his cattle upon the tender seedlings which sprang up after the forest fires.

After many years there came a period of utilisation of forests. Men became more settled, and timber became one of the necessities of life. Lands which had been long used for pastoral purposes—the cradle of the human race—no longer produced wood. Assyria, the greater part of Persia, and all the lands referred to in the Bible as the seats of learning and power, but now the most desolate and poverty-stricken of the countries of the world, were already beginning to reap the fruits of long-continued destruction, and we learn that even then there were not wanting wise and farseeing men who were ready to do what they could to stem the tide of destruction. You may read in Genesis that Abraham, having made an important covenant, desired to commemorate it in a way which would prove acceptable to the Lord, and so he "planted a grove in Beersheba," and, by the time the wonderful cycle of events recorded in the Old Testament had run its course, we find a national system of forest conservation in full swing, but too late, for we read that when Nehemiah desired to return from Babylon, to rebuild the Temple and city of his fathers, he prayed certain favours from the Babylonian monarch, Artaxerxes, and, amongst others, "A letter to Asaph, the keeper of the king's forest, that he may give me timber to make beams for the gates of the palace, which appertained to the house, and for the wall of the city, and for the house that I shall enter into."

Memorials of this utilisation of timber at a remote period of the world's history are found in the lake dwellings of Switzerland, the piles of which have been exhumed bearing the toolmarks of long-forgotten foresters, whom we may imagine holding discussions on the forestry conservation question when the pile supply began to give out, and the timber had to be sought too far afield. Thus does history repeat itself.

After the period of utilisation came the period of preservation. Men began to find that the seasons were not as they were when they were young. Lands where, in the days of their fathers, there were milk and honey, were gradually being covered by shifting sands or swept down year after year from the steep hill slopes into the valleys to form unhealthy swamps. As in some parts of France, the sands of the sea began to take quiet possession of immense tracts of country. Gentle and insinuating in their movements, more terrible in their ceaseless march than the hordes of a Timor, because what they conquered they held. France was the first country to follow the lead of the Babylonian king, and appoint a keeper of the king's forest to prevent the unauthorised cutting of the timber, and to secure the cutting only of mature timber, and in such manner that the succession of trees might be maintained. The custom was gradually extended to other countries. It came at length to be practised not only by the State, but by communes, corporations, cities, large landed proprietors, and even by persons holding land in comparatively small areas.

It was but a step from this to the planting stage. If it paid to regulate the felling of the forest, and produced in the long run an entirely new class of forest, surely it would pay, where there was a timber demand, to start *de novo* and to create forests. You will see at a glance that several ways of doing this would suggest themselves to the forester, as the man began to be called who thought much about these things and translated his thoughts into action. France and Germany ran neck and neck in the race for supremacy in forestry. It was found that this science—for such it became—differed from agriculture inasmuch as the crop might not be reaped in the year in which it was sown.

As regards the regulations for felling, also, there were many causes, operating over a series of years, to be closely studied, and contingencies of climate, demand for produce, character of soil, facilities for transport, and other matters with which we shall deal by and by, to be foreseen and provided for. So it was gradually found that each forest tract required to be studied, and what we call a "prescription" prepared for its treatment to cover a number of years. This was the birth of the "working plan," the greatest advance in the science of practical forestry. It is the plan of campaign according to which every part of an organised whole works. I shall, later, lay before you some working plans at the present moment in operation, and will invite your attention to the many-sided considerations which have to be studied in their preparation and application.

Thus you see man's relation to the forest passed through periods which we may compare to the periods into which archæologists have divided the time of man's sojourn on this planet as recorded in the remains which he has left imbedded in the earth upon which each generation strutted its little day. There were:—(1) The period of emergence. (2) The period of destruction. (3) The period of utilisation. (4) The period of preservation; and (5) the period of planting.

Now, as we find on the face of the earth some nations or tribes of people still in the stone age, and others but slightly advanced into the iron age, so we find different stages of progress amongst the nations as regards this matter of forestry. I remember when the late Mr. James Tyson, one of the most acute men on all matters connected with rural pursuits whom I have ever had the privilege to meet, came to me and said that, after much experience and experiment, he had arrived at the conclusion that to plant trees on the exposed lands of which he owned a goodly share, would prove a very profitable investment by allowing his cattle to use up the material in the production of beef which they were now devoting to the production of warmth, and asked me to give him some trees to plant in groups. I told him the story of the pastoralist Abraham "planting a grove in Beersheba." He was much interested, and said that we are evidently in the "Abraham" stage here. Australia is passing out of the destruction stage, and it will be well for her thousands of hardy sons engaged in the various phases of the timber industry, and for her pastoralists and farmers, if she passes out of it quickly.

Other nations, again, have made considerable advances in preservation, and their forests are, in consequence, assuming a character which will enable them in a very few years not only to provide abundant timber for all the purposes of their own people, but to capture no inconsiderable share of the markets of the world. India is in this stage. Fifty years ago the forests of India were on the verge of disappearance. Millions of people had been hacking at them for generations. Some great kings and rajahs had reserved portions, it is true, but only for hunting grounds; and as these had been subjected to no organised system of management they were in no condition to supply the timber wants of a large population, mainly without coal and iron. True, they needed but little fuel, and their constructive work was of the lightest, but even the little they wanted was not forthcoming at last, and the question became in some districts serious. The Government took the matter in hand, and a careful examination of the forests of the country was made by a conservator and his agents. The problem to be dealt with was wholly different from that which had to be solved in Europe, but practically the same means were applied to its solution. Slowly at first, the destruction was checked. Rights in the forests, if acquired in any reasonable way, and often when acquired in most unreasonable ways, were respected, but carefully defined, and not allowed to increase in an unlawful manner; simple regulations as to the trees to be cut were framed, and these were imperceptibly strengthened and amplified, and eventually the working-plan method was applied to immense areas of forest. But not the elaborate

working plans of France and Germany. These were simplified to meet altered requirements, but carefully framed in all essentials, and not to be departed from at the mere temporary whim of a new-comer. The divisional forest officer in India to-day may be, and probably is, working on the lines elaborated by a man who is long since dust. He is, as Vincent styles him, "the slave of the plan," but within the limits of the general plan there is abundant room for the display of individuality, and the object of the plan will be attained as he works it, and he has a living interest in its success. He sees it slowly unfolding before his eyes. The saplings whose seed leaves he may have seen unfold will be trees when his very name shall be forgotten; but in imagination he sees them as they will stand in serried ranks, tall and straight, bearing witness in the fulness of their prime to the keen eye and calculating brain which watched and ordered the progress of their youth. Could a man desire a better monument?

(To be continued.)

Times of Sunrise and Sunset, 1904.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5 51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·12
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	..	4·57	6·45

Phases of the Moon.

			H. M.
3 Sept.	☽	Last Quarter	9 58 p.m.
10 ,,	●	New Moon	6 42 a.m.
17 ,,	☾	First Quarter	1 12 ,,
25 ,,	○	Full Moon	3 49 ,,
2 Oct.	☽	Last Quarter	11 52 p.m.
9 ,,	●	New Moon	3 24 ,,
16 ,,	☾	First Quarter	3 54 ,,
24 ,,	○	Full Moon	8 55 ,,
1 Nov.	☽	Last Quarter	9 13 a.m.
8 ,,	●	New Moon	1 36 ,,
15 ,,	☾	First Quarter	10 35 ,,
23 ,,	○	Full Moon	1 11 p.m.
30 ,,	☽	Last Quarter	5 38 ,,
7 Dec.	●	New Moon	1 46 p.m.
15 ,,	☾	First Quarter	8 6 a.m.
23 ,,	○	Full Moon	4 1 ,,
30 ,,	☽	Last Quarter	1 46 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

	Rockhampton.		Townsville.		Cooktown.	
1904.	Rise.	Set.	Rise.	Set.	Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m.	28 m.	26 m.	32 m.	30 m.
October ...	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m.	40 m.	14 m.	50 m.	12 m.
December ...	8 m.	2 m.	44 m.	10 m.	55 m.	7 m.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1903.					1904.							
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
North.													
Bowen	0·22	0·51	1·36	3·14	6·13	3·45	2·65	1·12	0·31	0·25	0·30	Nil	Nil
Cairns	0·44	0·47	0·91	3·10	13·51	10·03	10·55	15·73	13·33	3·21	Nil	0·35	0·62
Geraldton	7·08	3·79	3·05	7·13	37·86	24·37	14·04	31·09	38·73	11·81	0·39	1·78	3·99
Herberton	0·33	Nil	0·67	6·21	15·52	8·01	5·16	18·25	7·08	1·55	Nil	Nil	0·59
Hughenden	0·31	0·65	0·80	2·36	5·30	2·71	2·80	1·93	1·36	0·07	0·44	Nil	Nil
Kamerunga	1·50	0·86	1·39	4·94	14 33	7·37	9·39	22·35	15·48	3·50	Nil	0·42	1·05
Longreach	Nil	1·58	0·90	0·83	1·76	1·77	2·69	1·01	0·31	2·78	0·04	Nil	Nil
Lucinda	4·39	0·30	0·76	10·67	40·31	11·71	8·40	22·40	11·30	4·00	Nil	0·45	Nil
Mackay	0·59	0·44	1·54	9·86	5·52	16·74	3·17	5·69	5·24	3·61	0·93	0·12	0·04
Rockhampton	0·68	0·54	1·84	7·42	4·08	5·12	3·50	5·11	13·82	0·77	1·26	0·03	Nil
Townsville	0·19	0·44	2·42	5·97	19·02*	5·48	5·19	4·01	1·03	0·24	0·04	Nil	Nil
South.													
Barcaldine	0·50	4·23	1·01	4·00	0·92	3·26	0·96	0·11	1·19	3·85	0·16	Nil	Nil
Beenleigh	2·26	4·13	3·29	4·78	1·60	2·81	1·25	8·06	14·99	6·17	0·15	1·54	0·25
Biggenden	1·62	2·23	2·77	4·37	5·62	7·48	0·71	3·16	2·92	2·29	0·71	0·29	0·29
Blackall	0·75	2·25	0·45	2·56	1·79	2·28	3·67	0·39	3·76	3·08	0·32	0·12	0·14
Brisbane	3·84	4·73	3 65	3·98	2·19	2·65	0·77	7·07	7·23	4·04	0·59	1·48	0·53
Bundaberg	0·88	3·55	0·43	3·25	9·97	3·18	0·85	4·26	5·64	1·32	0·86	0·51	0·62
Caboolture	3·27	4·41	3·11	9·98	4·18	4·29	1·32	8·48	9·90	4·66	0·17	2·12	0·30
Charleville	0·62	3·40	0·95	2·20	2·98	1·87	2·56	4·60	3·62	3·07	0·31	0·52	0·15
Dalby	2·30	3·30	3·12	6·30	1·19	1·88	3·20	4·74	0·40	4·69	0·34	2·63	0·24
Emerald	0·24	1·28	1·90	2·21	4·30	2·70	1·26	4·14	5·88	1·23	0·96	0·06	0·09
Esk	4·21	4·86	3·69	4·02	1·43	2·37	1·86	3·18	4·91	3·99	0·20	2·43	0·33
Gatton College ...	2·50	3·56	4·71	5·05	1·04	2·15	1·20	4·17	2·59	3·79	0·45	2·12	0·07
Gayndah	1·06	2·62	4·37	3·03	5·12	7·01	1·83	2·97	1·63	1·61	0·93	0·99	0·41
Gindie	0·30	1·58	1·97	4·06	4·26	1·52	1·40	1·83	4·81	1·65	0·43	Nil	0·21
Goondiwindi	2·09	4·22	2·16	3·73	3·62	2 90	2·65	7·32	0·37	3·40	0·49	2·62	0·67
Gympie	2·72	2·42	5·61	4·50	4·88	9·27	1·80	3·32	10·86	4·11	0·60	1·11	0·47
Ipswich	2·70	5·24	2·98	3·84	1·01	4·07	1·72	3·55	4·71	3·50	0·23	1·75	0·05
Laidley	3·06	4·25	5·47	3·87	1·82	2·93	1·35	5·36	2·83	3·12	0·32	1·68	Nil
Maryborough	1·09	1·93	2 62	3·96	5·04	2·64	0·56	3·94	10·07	4·42	1·37	0·39	0·46
Nambour	3·95	3·60	3·85	6·13	2·43	6·39	1·91	10·30	15·43	6·94	0·32	1·78	0·59
Nerang	2·21	3·81	3·52	3·86	4·24	3·80	0·85	11·18	13·83	7·52	0·19	1·12	1·22
Roma	1·13	6·61	1·92	3·16	4·21	1·85	0·59	2·32	5·06	3·73	0·20	0·84	0·70
Stanthorpe	1·98	6·07	3·45	4·45	2·59	2·29	1·33	6·57	0·71	4·11	0·68	2·64	0·34
Tambo	0·27	4·33	1·08	3·17	2·91	2·48	1·72	1·26	5·46	3 96	0·28	0·61	0·22
Taroom	2·21	1·51	2·05	3·76	3·22	1·39	2·79	1·58	2·21	3·49	0·54	0·59	0·82
Tewantin	5·70	5·80	2·85	9·85	1·37	3·03	2·59	19·55	30·39	9·20	0·21	1·11	2·20
Texas	3·21	4·55	2·47	4·93	4·44	1·70	3·67	5·72	0·03	2·99	0·70	2·12	0·48
Toowoomba	3·00	4·06	3·82	4·85	4·27	4·26	3·98	4·76	3·29	4·08	0·38	2·58	0·02
Warwick	2·63	3·41	2·89	3·92	2·73	0·60	2·91	5·74	0·66	2·85	0·53	1·98	0·19
Westbrook	1·63	3·89	4·03	5·11	3·75	1·46	2·82	3·49	9·00	3·18	0·22	2·24	0·14

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian, average, 82s. to 86s.; Danish, 102s. to 104s.; New Zealand, 90s. to 92s.; Queensland, 78s. to 86s.; Canadian, 82s. to 88s. per cwt.

CHEESE.—Canadian, 37s. to 40s.; New Zealand, 35s. to 40s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £18 to £19 6s.; raw, £15 to £17 6s. per ton; German beet, 88 per cent., 9s. 9½d.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—4s. to 8s. 6d. per cwt.

RICE.—Rangoon, £8 to £12 6s.; Japan, £14 to £17 6s.; Java, £17 to £23; Patna, £15 to £18 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 44s. to 130s.; peaberry, 100s. to 120s.; Santos, 30s. to 46s.; Mocha, 52s. to 90s.; Jamaica, 100s. to 125s. per cwt.

CHICORY ROOT (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 1⅝d. to 3½d.; Natal, 5¾d. to 7d.; Bermuda, 1s. 2d. to 1s. 5d. per lb.

WHEAT.—Duluth, 35s. to 36s. per 496 lb.; English, 29s. to 32s. per 504 lb.; Australian, 31s. 6d. to 32s. per 480 lb. = 3s. 11½d. to 4s. per bushel.

FLOUR.—26s. to 33s. per 280 lb.

MALTING BARLEY.—30s. to 32s. per 448 lb.; grinding, 36s. to 40s. per 416 lb.

OATS.—New Zealand, 22s. to 24s. per 384 lb.

SPLIT PEAS.—38s. to 38s. 6d. per 504 lb.

GINGER.—Jamaica, 47s. to 60s.; Cochin, 42s. to 60s.; Japan, 17s. to 18s. per cwt.

VANILLA.—3s. to 7s. per lb.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 45s. to 50s. per cwt.; black, 4⅞d. to 5¼d.; white, 7¼d. to 7½d. per lb.

GREEN FRUIT.—Apples: American, 12s. to 20s.; Australian, 4s. to 6s. 6d.; Tasmanian, 7s. 6d. to 12s. 6d. per case; bananas, 6s. 6d. to 13s. per bunch; pineapples, 2s. 9d. to 5s. 6d. each; oranges, Valencia, per 420, common, 18s. to 20s.; medium, 18s. to 21s.; fine selected, 24s.; lemons, Messina, per 360, ordinary to fine, 7s. to 9s.

DATES.—Tafilat, none; Egyptian, none; Persian, 6s. 3d. to 10s. per case.

COTTON.—Uplands, 5½d. to 8d.; Sea Island, 1s. 2d. to 1s. 6d. per lb.

COTTON SEED.—£5 10s. to £7 per ton.

COTTON-SEED OIL.—Crude, £17; refined, £18 to £19 10s. per ton.

COTTON-SEED OIL CAKE.—£6 to £7 per ton.

COTTON WASTE.—In 5-cwt. bags, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—34s. to 34s. 6d. per 416 lb.

LINSEED OIL.—£17 to £17 15s. per ton.

LINSEED OIL CAKE.—£6 10s. to £6 15s. per ton.

OLIVE OIL.—£30 to £55 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 15s. to £17 10s. per ton; £8 to £9 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£28 to £31 per ton.

BEESWAX.—Australian, £7 2s. 6d. to £7 5s. per cwt.

LUCERNE SEED.—60s. to 70s. per cwt.

CANARY SEED.—72s. to 80s. per quarter of 480 lb. = 8s. 9d. to 10s. per bushel.

MANILLA HEMP.—£30 to £35 per ton.

SISAL HEMP.—£35 to £39 2s. 6d. per ton.

NEW ZEALAND HEMP.—£28 15s. per ton.

FLAX.—£48 to £52 per ton.

TAPIOCA (duty, 5d. per cwt.).—2¾d. to 5d. per lb.; pearl, 11s. to 15s. 6d. per cwt.

EGGS.—French, 8s. to 10s.; Danish, 6s. 3d. to 9s. 4d. per 120.

BACON.—Irish, 48s. to 61s.; American, 42s. to 48s.; Canadian, 46s. to 50s. per cwt.

HAMS.—Irish, 76s. to 92s.; American, 35s. to 36s. per cwt.

TALLOW.—Mutton, fine, 27s. to 28s.; medium, 25s. to 25s. 9d; beef, fine, 25s. to 25s. 6d.; medium, 24s. to 25s.

GOATSKINS.—Cape, from extra light to heavy, 9d. to 13½d.; Angora, light to heavy, 5d. to 7½d.; Natal, goat and Angora, 1¾d. to 8d. per lb.

POULTRY (Smithfield).—Good supplies; better demand. Quotations:—Fowls: Yorkshire, 3s. to 3s. 6d.; Essex, 2s. 9d. to 3s. 3d.; Boston, 2s. 6d. to 3s.; Surrey, 3s. 6d. to 4s. 6d.; Sussex, 3s. to 4s.; Welsh, 2s. 6d. to 3s.; Irish, 2s. to 2s. 6d.; goslings, 5s. to 6s.; Aylesbury ducklings, 3s. to 4s.; country, 2s. 3d. to 2s. 9d. each; Australian wild rabbits, 6s. 6d. to 8s. 9d. per dozen.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Sept. 17.	Sept. 24.
New Zealand Sheep. (Crossbred Wethers and Maiden Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{7}{16}$d.	$4\frac{7}{16}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{8}$d.	$4\frac{1}{8}$d.
Dunedin and Southland (56 lb. to 64 lb.)	$4\frac{1}{16}$d.	$4\frac{1}{8}$d.
North Island (56 lb. to 65 lb.), ordinary	$3\frac{15}{16}$d.	$4\frac{1}{16}$d.
North Island, best	4d.	4d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	None offering.	
Light (under 50 lb.)	None offering.	
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{9}{16}$d.	$3\frac{9}{16}$d.
Light (under 50 lb.)	$3\frac{7}{8}$d.	$3\frac{7}{8}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$5\frac{5}{8}$d.	$5\frac{5}{8}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{9}{16}$d.	$5\frac{1}{2}$d.
North Island (28 lb. to 42 lb.) ...	$5\frac{1}{2}$d.	$5\frac{7}{16}$d.
Australian Lambs.		
30 lb. to 40 lb.	None offering.	
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	$2\frac{1}{2}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{2}$d.	$3\frac{7}{16}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	2d.	2d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{3}{4}$d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{1}{4}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{3}{16}$d.	$3\frac{1}{16}$d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the home market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand.

General Notes.

AUSTRALIAN STUDENT AT A SCOTCH UNIVERSITY.

The young Australian student at the Edinburgh University who mounted and rode without saddle or bridle one of the wild horses at Penicuik, during a visit to the Natural History Experimental Station, which we made mention of in our last issue, was James Argyll Campbell, only son of the late Dr. Campbell, of Frescati, Ann street, Brisbane. He left by the "Oroya" last February to study medicine at the Edinburgh University. Before leaving Queensland he spent nine months in the bush. The young student has just gained First-class honours in Theoretical and Practical Botany and Second-class honours in Theoretical and Practical Zoology, and has also passed most creditably his first Professional Examination.

SISAL HEMP FROM CAICOS ISLANDS.

An excellent sample of sisal hemp was recently received from His Honour the Commissioner of the Turks and Caicos Islands, who wrote, under date 22nd March, 1904:—"The sample I send you is from a plantation owned by an American firm. From the two fibre plantations in the Caicos we exported last year 443,870 lb., valued at £6,488."

The sample, which was a remarkably good one, the fibre being bright and strong, was forwarded by the Imperial Commissioner of Agriculture to Messrs. Ide and Christie, who have furnished the following satisfactory report:—

"Your favour of the 5th instant, with sample of sisal hemp from the Caicos Islands, safely to hand. The latter shows first-class material, better than any of the Mexican and as good as the best from the Bahamas. Value, £33 per ton, but less to sell quantity. For the past few years we have seen small lots on this market. Manila hemp being on the downward move, all hard hemps are likely to fall in value."—*Agricultural News*, Barbados.

[The above sale comes to about £32 15s. per ton. In the New York market the fibre would probably have brought considerably more.—Ed. *Q.A.J.*]

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

THE OPIUM POPPY.

J. W. Price, Mooloolah.—

The cultivation of the opium poppy was tried experimentally in Queensland forty years ago. The plants grew well, and produced fine seed heads, but it was found that it would be necessary to have a large supply of the cheapest labour for securing the crop. Each capsule has to be incised by drawing a knife round two-thirds of it. The incisions must not penetrate to the interior lest the juice should flow inside and be lost. The operation begins in the afternoon and ends at nightfall. Next morning the exuded and concreted juice is scraped off with a knife. The fields are visited a second and third time to collect the juice from the poppy heads subsequently developed by the branching of the stem. The yield is about 4 lb. per acre, and the whole work of collecting must be done in the few days—five to ten—during which the capsules are capable of yielding the drug. A shower of rain will wash all the opium off the capsules. Opium is a most uncertain crop, and would certainly not pay to grow in any country where there is not a teeming native population as in India or China.

TICKS ON ANGORAS.

U. L. Broadley, Oaklands, Cairns.—

We are at this moment making inquiries on the subject of a wash for Angoras to destroy the scrub tick, to ascertain whether such wash would injure the mohair. As soon as we obtain the information we will advise you. Scrub ticks frequent tall grass adjoining scrubs. Mr. Cory, Veterinary Officer of the Department, advises the use of the ordinary arsenic dip; he does not consider that it will injure the fleece.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	SEPTEMBER. Prices.
Apples, Eating, per packer	...
Apples, Cooking, per case	...
Apples, Tasmanian, per case	7s. 6d. to 8s.
Apples, American, Eating	...
Apples, American, Green	...
Lemons, Italian, per 360	...
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Lemons, Sydney, per case	3s. 6d. to 4s.
Oranges, Italian, per 180	...
Oranges, Local, per case	3s. to 3s. 6d.
Oranges, Sydney (packers)	...
Mandarins, Local, per case	4s. to 4s. 6d.
Mandarins, Bowen	...
Apricots, New South Wales, boxes (half-gincase)	...
Apricots, American, per 108's	...
Plums, American, per 108's	6s. to 6s. 6d.
Plums, Sydney, per 108's	...
Peaches, half-gincase	...
Nectarines, half-gincase	...
Gooseberries, English	...
Cherries, American, per lb.	...
Passion Fruit, half-gincase	5s. to 6s.
Mangoes, per case	10s. to 10s. 6d.
Pineapples (smooth leaf), per dozen	2s. to 2s. 9d.
Pineapples (rough leaf), per dozen	1s. 3d. to 1s. 9d.
Melons	...
Loquats, half-gincase	4s. to 4s. 6d.
Rockmelons	...
Bananas (sugar), per dozen	1¼d. to 1½d.
Bananas (Cavendish), per bunch	8d. to 1s.
Tomatoes, quarter-case	4s. to 4s. 6d.
Papaw Apples, quarter-case	...
Custard Apples, quarter-case	...
Granadillas, case	...
Seville Oranges, apple-case	...
Cape Gooseberries, quart	...
Pears, American, per 72's	...
Pears, Tasmanian quarter-case	...
Peanuts, per lb.	3¼d. to 3½d.
Rosellas, per sugar-bag	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER.

Article.		SEPTEMBER. Prices.
Bacon (Pineapple)	lb.	5½d. to 7d.
Barley, Malting	bush.	...
Bran	ton	£2 10s.
Butter, Factory	lb.	8½d. to 9d.
Chaff, Mixed	ton	£2 10s. to £2 15s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER—*continued.*

Article.		SEPTEMBER. Prices.
Chaff, Oaten	ton	£4 17s. 6d. to £5
Chaff, Lucerne	"	£2 to £3
Chaff, Wheaten	"	£1 15s. to £2
Cheese	lb.	$4\frac{1}{2}$d. to 5d.
Flour	ton	£7 15s. to £8
Hay, Oaten	"	£4 17s. 6d. to £5
Hay, Lucerne	"	£1 12s. 6d. to £2
Honey	lb.	$1\frac{1}{2}$d.
Maize	bush.	1s. $8\frac{1}{2}$d. to 1s. 10d.
Oats	"	1s. 9d. to 3s. 8d.
Pollard	ton	£2 15s.
Potatoes	"	£2 to £3 2s. 6d.
Potatoes, Sweet	"	£1 5s.
Pumpkins	"	£1 3s. 4d. to £1 11s. 8d.
Wheat, Milling	bush.	2s. $10\frac{1}{2}$d. to 3s. 2d.
Wheat, Chick	"	1s. 9d. to 2s. 6d.
Onions	ton	£3 to £4.
Hams	lb.	$8\frac{1}{2}$d. to $9\frac{1}{2}$d.
Eggs	doz.	$5\frac{1}{2}$d. to $6\frac{1}{2}$d.
Fowls	pair	2s. 1d. to 3s. 9d.
Geese	"	4s. 8d. to 7s.
Ducks, English	"	2s. 6d. to 3s. 6d.
Ducks, Muscovy	"	2s. 9d. to 4s. 6d.
Turkeys, Hens	"	5s. 6d. to 7s. 6d.
Turkeys, Gobblers	"	8s. 6d. to 11s. 6d.

ENOGGERA SALES.

Animal.	SEPTEMBER. Prices.
Bullocks (extra heavy)	£15 5s.
Bullocks	£8 12s. 6d. to £11 12s. 6d.
Cows	£6 17s. 6d. to £7 12s. 6d.
Wethers, Merino	19s. 3d. to £1 0s. 6d.
Wethers, C.B.	£1 1s. 6d. to £1 3s.
Lambs	16s. 3d. to 18s. 3d.
Pigs (Baconers)	£1 14s. 6d.
Pigs (Porkers)	£1 7s.

SALES AT THE EXHIBITION, BOWEN PARK.

Animal.	AUGUST. Prices.
Bullocks	£17 5s.
Cows	£10
Wethers, Merino	£1 2s.
Wethers, C.B.	£1 8s.
Ewes, C.B.	£1 2s.
Lambs	14s.

Orchard Notes for October.

By ALBERT H. BENSON.

Keep the land well cultivated, and, if dry, see that it is well stirred, but not turned. Attend to the disbudding of all young trees, for, if superfluous growths are checked now, they are converted into fruit-wood, and the vigour of the tree is thrown into those shoots which are to form the future branches of the tree. Disbud all vines, rubbing out all superfluous shoots, leaving only as many canes as the vine is strong enough to mature fruit to perfection on.

Sulphur all vines to prevent oïdium, as, if there is any muggy weather during the month, this disease is sure to make its appearance. Where Black-spot is present, spray the vines with Bordeaux mixture; and if caterpillars are troublesome as well, then add 1 oz. of Paris green to each 2 gallons of Bordeaux mixture, and both pests will be destroyed by the one spraying. When using Bordeaux mixture there is no necessity to use sulphur for oïdium, as the Bordeaux mixture answers equally as well. Don't spray when the vines are in blossom; but with varieties that are shy setters it is often a good plan to sulphur when in blossom.

The nursery should be carefully attended to; where not already done the ties of all grafts should be cut and the scions should be trained so as to make a single upright stem. Where buds have been put in, they should be started by cutting back the stock sufficiently to cause them to grow, but the stock should not be cut hard back all at once, but by degrees, always leaving a portion of the stock above the bud to tie the young shoot to. Plant pines and bananas during the month, selecting suckers from healthy plants and from plants that are good croppers, and that produce good fruit, as a careful selection of suckers always pays well. Continue the treatment for Maori or Rust Mite of the orange recommended in the Notes for September; and where orange bugs, either the green or bronze, are present, destroy every mature insect that can be found, so as to prevent them breeding, as the killing off of the first crop will materially lessen their number for the season. Hand-picking, though slow, is probably the best remedy, though, before the insects are fully grown, large numbers may be destroyed by driving them on to the main branches of the trees and sweeping them off with a broom on to a cloth, from which they can be gathered and killed. Take every possible precaution against the fruit fly by destroying every infested fruit that you can. If there are maggots in cumquats or any other fruits, destroy every one, as the cleaner the sweep that is made of the first crop of flies the less trouble there will be throughout the season. Where Scale Insects have been introduced on young trees into clean districts, every care should be taken to keep the pest from spreading; and in cases where the young trees are badly affected, it will pay the grower to destroy them at once, as the first loss will be the least. Where leaf-eating insects of any kind are troublesome—such as caterpillars of all kinds, the larvæ of the fig beetles, or the false ladybirds that attack all kinds of cucurbitous plants, potatoes, &c.—they can be readily destroyed by a spraying of Paris green, 1 oz. to 10 gallons of water, with lime added in as large a quantity as can be got through the nozzle of the pump without choking, as this will tend to make the poison stick on better to the leaves, branches, or fruit.

Farm and Garden Notes for November.

Why do so few farmers grow their own vegetables? This is a question that is frequently asked by visitors to the farming districts. The reason probably is that vegetables require a good deal of care and attention, which mean also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them for himself. The only vegetables grown on many fine farms are cabbages and pumpkins, not to class potatoes under that head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy. The Chinese gardeners supply the towns with all kinds of vegetables, except perhaps cauliflowers, during the whole of the summer. It is therefore clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March.

Field.—Under ordinarily favourable conditions, harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into the leaves. Keep down the weeds, which will now try to make headway; earth up any growing crops requiring the operation; sow maize, imphee, setaria, Kafir corn, teosinte, sorghum, &c. Plant sweet potatoes, sisal hemp, yams, earthnuts, and ginger.

Kitchen Garden.—If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow-dug ground. When sowing and planting this month, give plenty of room between the rows and the plants, otherwise they will be drawn up and worthless, and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines. They will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radish, pumpkins, cucumbers, marrows, rosellas, &c., and transplant for succession in calm cloudy weather.

Flower Garden.—Stake any dahlias which may now be above ground. Plant out the bulbs which were stored in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs that have done flowering, and store in a dry place. Winter flowering plants will have gone off almost, still the garden should be in full bloom, and will well repay the trouble bestowed on it, and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if this were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissus. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer asters, summer chrysanthemums, calliopsis, and nemophila.

Agriculture.

FARMING AT BARCALDINE.

Ever since the breaking up of the drought at the end of 1902, the Central District of Queensland, which suffered so severely during the years when no rain fell, streams and waterholes dried up, and the very trees which had experienced previous droughts, and had survived them, perished—ever since the first rains heralded the close of this period of distress, the country comprised in the vast extent of the Central District from Gladstone to Rockhampton, and St. Lawrence on the coast and westward to Longreach, Blackall, Winton, and Boulia, has been singularly favoured by Nature. Where, previous to 1903, nothing was to be seen but desert sand, dead cattle, and sheep, waterless rivers, and forests of dead trees, there is to-day a wealth of splendid grass, herbs, and saltbush. Young trees once more are beginning to assume large proportions. Waterholes are full to overflowing, rivers and streamlets are running with clear water, rippling and tinkling over their sandy or pebbly bottoms with a sound peculiarly grateful to all who had passed through the terribly trying time of the previous five years. Still, although grass and water abound everywhere, it is plainly apparent that quite three years must elapse before the cattle country can be even fairly stocked again. Sheep, on the other hand, have increased wonderfully, and good authorities on the pastoral industry maintain that in another year the number of sheep in the district will equal the number prior to the drought.

Meanwhile general farming is extending in many parts of the Central District. Emerald, Springsure, Alpha, and Barcaldine are progressing in this direction. The land is well adapted for wheat-growing, especially where bore water is available. In October, wheat-harvesting was in full swing at Geera (Mr. Hannay's farm), at Mr. Cronin's, close to the town of Barcaldine, at Mr. Shave's, and Mr. Murray's. At Coreena a splendid crop was harvested. Mr. Hannay had a magnificent crop of Manitoba wheat, which could not possibly be excelled in any part of the world for size of ear, plumpness of grain, and length of straw. Marshall's No. 3, of which there were 30 acres nearly ready for harvesting at the end of the month, gave promise of from 30 to 40 bushels per acre. A field of Indian Club wheat did not do so well, having been sown too late. There is no sign of rust anywhere, but here and there bunt was visible. The young maize looked very healthy, and was so far advanced that a heavy crop may be looked for.

The cloud water and bore water would seem to be antagonistic to each other. When the wheat was well in the ear, a very heavy fall of rain took place, with the result that the irrigated wheat ripened irregularly, and on some fields the spectacle was to be seen of patches perfectly ripe, others half ripe, and others again still not much beyond the milk stage. All things considered, however, the crop generally is expected to turn out well, the average yield being set down at about 25 bushels per acre.

There is a movement on foot to purchase the Rockhampton flour-mill, and to erect it at Barcaldine. A company for this purpose has been projected, and some few thousand shares have been taken up. But the project hangs fire, owing to the heavy railway freight on grain which the company would have to import from the South until sufficient wheat is grown in the district to render the mill independent of outside supplies.

There can be no question that the establishment of a flour mill at this town would be of great advantage to the West. At present consumers have to pay £4 per ton freight on flour. The advent of the mill would quickly bring down the price of flour, and the miller would be protected by the high railway

freights. The charge for imported grain from Brisbane to Barcaldine is £5 7s. 4d. per ton. To send the wheat to Brisbane would entail payment of £3 1s. per ton, which is practically prohibitive, but a rebate of 30 per cent. is allowed for distances over 350 miles. Either a mill must be built at Barcaldine or Emerald, or the wheat-growing industry, which has started with such great promise, must collapse. Until this question is settled, all the grain grown this season, as well as some of last season's, which is in stack, will remain on the farmers' hands.

As for other cultivation, some farmers have good crops of oats, barley, and rye. Lucerne is not yet grown, and it is very doubtful if the crop could stand the intense dry heat in spite of the bore water, which can supply far more than the needs of this water-loving plant.

Grapes are doing very well this year. In all the gardens in and around the town there is a very good crop coming on. At the Alice River settlement the vineyards have made great progress, and the settlers should do well out of them this season. They have got some Zante currants as well, and these are bearing very satisfactorily.

Citrus fruits are thriving. There will be a good crop of lemons, but the orange crop will not be a heavy one. Mr. Harry Grimm has the finest show of fruit in the town gardens. His bananas have increased considerably, and although the bunches of fruit are not so large as those grown at Geraldton and Cairns, still they are of fair size, and give proof that bananas can be grown, at all events for local use, in this part of the world.

It is singular that so few mango-trees have been planted in the past. There are several fine trees laden with fruit in two or three gardens. Lately, however, attention appears to be given to this fruit, as, in most of the gardens, young trees have been planted, and look very healthy when they have been carefully shaded until firmly established. Papaws also are neglected, although they do very well and bear profusely.

In Mr. Peut's garden there are some very fine sisal hemp plants *(Agave rigida*, var. *sisalana)*. A consignment of these plants reached Barcaldine a few years ago, and the purchaser distributed some in the town. They have grown admirably without the slightest care, and are quite equal in size and number of leaves to those grown at St. Helena. As for Fourcroya and other similar fibre plants, these may be seen in all directions, and generally on the sites of the abandoned railway camps. Many have grown to a great size, some having leaves measuring 10 feet in length. There is ample proof that the Western country is eminently adapted to this plant. All along the railway line for a distance of 369 miles isolated patches may be seen on the stock routes or in paddocks and gardens. They have come unscathed through drought, bush fires, and the trampling of cattle and sheep. One of the constituents of the best sisal hemp soils is lime. Here there is no sign of lime in the sandy soil, yet no finer plants are to be seen anywhere in Queensland. If the sisal fibre were grown in the neighbourhood of the bores, the machinery required for its extraction could be driven by undershot water-wheels at very slight expense. The waste fleshy matter of the leaves could be sent along the irrigation drains, and could thus be utilised as manure.

With regard to the bores, several additional ones have been put down since our previous visit to the district. The cost of these necessary works has been very considerably reduced. Where in former years a bore 1,000 feet deep cost £1,000, the same work is done for from £500 to £600, which includes casing.

It was freely rumoured in the South that some of the Western bores were falling off in the supply of water, but on inquiry we were assured by Mr. Brown, the well-known American well-borer, that this is not so. The pressure in three or four instances had undoubtedly diminished, but on examination it was found that fissures existed in the rock, and where there was no casing in parts of the bore the water escaped through these fissures. Mr. Brown's services were availed of in one case where the supply appeared to have diminished. In a very

short time he had supplied the remedy, and when the work was completed the water rose to a greater height above the casing than when the supply was first struck. Neither Mr. Brown, Mr. Vance, nor Mr. Sparham, who all have had a long experience in the district, entertain any fear of the bores giving out or even diminishing, provided proper care be taken in fixing the casing.

From what we saw of the progress of Barcaldine since our visit in the early part of 1903, we have every reason to believe that, with the advent of immigration, of financial prosperity, and reduced railway rates, the district will vie with the Darling Downs as a wheat-producer. When this happy state of affairs comes about, the town of Barcaldine must develop into the Toowoomba of the Central District. Much might be said for the town of Emerald, with its excellent soil, its railway lines extending northwards to Clermont, southwards to Springsure, eastward to Rockhampton, and westward to Longreach. The principal factor needed to push the Emerald district ahead is water conservation, for which there exist great facilities on the Nogoa River. But for this development money is required. When that is forthcoming, then Barcaldine will have to hustle to preserve its present pre-eminence.

FLAX CULTURE.

The Irish Flax Crop.

An Irish paper says that at the annual meeting of the Flax Supply Association, held in Belfast, the President (Mr. N. D. McMaster, J.P.) stated that for a second year in succession there had been a 10 per cent. decrease in the area under flax in Ireland, and that the yield per acre had fallen away by 18 per cent., making altogether a diminution of 2,900 tons in the supply of home-grown fibre as compared with 1902, and 4,735 tons as compared with 1901. One of the chief reasons which induced farmers no longer to sow flax was that in many cases there is a scarcity of labourers. Capital would have to be provided at certain centres, and a permanent staff employed the whole year round. That was not an easy matter to organise, but he felt sure that, unless some such steps as he mentioned were taken, flax-growing in Ireland would become less and less year by year.

From the above it would appear that there is likely to be a good market for flax in Great Britain, and, seeing that the plant grows to perfection in Australia, there is no reason why Queensland should not follow the example of Messrs. Woolfe Brothers, in Gippsland, and take a hand in growing something for which there is always a brisk demand in the old world. Flax is quoted in the British market at from £48 to £52 per ton, but putting the price at £40 only per ton, and the yield of flax at 6 cwt. of fibre and 12 bushels of seed at 4s. 5d. per bushel per acre, there is more money in flax-growing than in maize or wheat. Messrs. Woolfe Brothers estimate their profit at about £6 per acre when the crop is pulled by hand, so that it may not be out of place to set down the profit when the crop is cut by machinery at between £7 and £8 per acre. A glance over our market reports will serve to show that the demand for fibres of all descriptions is very large in the British market, and that the prices fluctuate very little from month to month.

Under the heading of

A Neglected Industry

the *Daily Mail* writes:—

The soil and climate of Victoria (says the Melbourne *Age*) are eminently suitable to the cultivation of flax. Land which is now annually cropped for wheat, oats, and other cereals—often at a loss, because of a glutted market—would return much higher profits if applied to this industry, for flax is a non-perishable commodity, and the demand for it is virtually unlimited. A glance at the statement of Australian imports, published in the *Age*, will serve

to show the extent to which a vast source of national wealth has in this respect been improvidently neglected. The list of imports for 1903 includes—

Canvas, free	£140,765
Flax and hemp, rope, &c., free	129,739
Bags, sacks, packs, and bales, free	550,746
Towels and handkerchiefs, 15 per cent. ...	129,472
Twine and yarn, 5s. per cwt.	39,148
Linseed oil, 6d. gallon	104,096
Total	£1,093,966

If proper attention were devoted to flax cultivation, and the tariff framed to encourage industry, the greater part of this £1,000,000 would go into the pockets of local producers and wage-earners. This sum, however, though large, by no means represents the total value of the imports manufactured from flax, or for which manufactures of flax may be substituted. It is hardly possible to arrive at the exact figure, owing to the methods of tariff classification. Bearing in mind the fact that flax may be profitably cultivated in almost any part of Victoria, and that the local product is generally superior to the best imported, the following figures, showing the approximate acreage under crop in different countries, are equally instructive:—

Country.	Acres.
Victoria	500
Ireland	47,451
Austria	117,067
Hungary	45,497
Belgium	75,618
France	43,457
Germany	150,628
Holland	20,113
Italy	123,000
Norway	4,169
Roumania	62,876
Russia	2,612,268

Russia and Germany export linen piece goods to the annual value of millions of pounds, and freely exploit the Australian market, because Australian statesmanship and industrial enterprise have been too purblind to recognise the resources which are an important feature in this country's great natural endowment.

Even under present conditions the farmer may put a part of his land under flax, with the certainty that the exercise of ordinary intelligence and industry will bring him good profits, but, if the manufacture of flax goods is to be developed to the extent of supplying the home market, the only effective means is the imposition of Customs duties sufficient to protect the local manufacturer and create local competition. Messrs. Miller and Co., rope and twine manufacturers, of Melbourne, who have taken a keen interest in this industry, and have erected extensive machinery for flax manufacture, offer to buy all the fibre that is likely to be produced during the next few years at prices ranging up to £45 per ton. Members of the firm expect that next year, as a result of this year's crop, they will be called upon to buy about 100 tons. From that already bought they have manufactured twine for sewing bags, rough towelling, &c., and would find it possible, if the tariff were sufficiently protective, to manufacture the finest linen. Were not canvas free of duty, the industry might be extended greatly by the manufacture of that article also.

The chief growers of flax in Victoria are Messrs. Woolfe Bros., of Gippsland, who last year sold flax to Messrs. Miller and Co. to the value of £1,000. In a recent issue of *The Leader*, Mr. Herman Woolfe wrote:—"This year my

brother and I are sowing 250 acres, and are inducing our neighbours to put in a like quantity. We offer the average price of £5 per acre, delivered at our mills. That means we are buying the crop after it has been cut with a reaper and binder, stooked in the ordinary way, and thence carted to our place at Maffra. In view of the low prices likely to rule for chaff and grain in the future, it may be submitted that an average of £5 an acre will be a good thing for farmers, besides giving a lot of work to deserving men and a handsome profit to the manufacturer." In order to show the return per acre likely to be gained from flax cultivation, Messrs. Woolfe Bros. recently supplied the Agricultural Department with the following statement:—

Income per Acre.

	£	s.	d.
From 10 bushels linseed, per acre	4	0	0
From 5 cwt. fibre...	11	5	0
	£15	5	0
Expenditure	8	12	6
Profit per acre	£6	12	6

Expenditure per Acre.

Rent per acre	£1	10	0
Cultivation and seed	1	5	0
Harvesting (with binder)	1	0	0
Threshing	0	12	6
Spreading	0	7	6
Drying and stacking (ready for manufacture) ...	0	7	6
Manufacturing	3	10	0
Total	£8	12	6

The gross returns from 120 acres were over £1,800.

With a little of the enterprise and spirit which are said by Foster-Fraser to animate the farmer of Western America, it would not be long before the Australian flax industry took rank with mining, dairying, and wheat-growing. "The American farmer," says that writer, "has no old-fashioned notions. If he reads of a new agricultural implement that does wonders, 'Gee-wish, I guess I'll have one,' he says. If he hears of the possibility of raising a new product, he writes to the Agricultural Department for all information, studies it up, and next year has a few acres in just as a trial." The American farmer is prosperous accordingly, and, what is more, Congress adequately protects the home market to encourage him, and to enable the manufacturer and the workman to live comfortably while working up his raw material. Once a fair quantity of flax is produced in Australia it will be folly to send it abroad and pay the foreign workman for manufacturing it and sending the finished article back to us. As already shown by the enterprise of Messrs. Miller and Co., there is a splendid field for local manufacture, and the only incentives required are adequate protective duties and activity by the Agricultural Department to bring the advantages of flax cultivation prominently under the farmers' notice.

A pamphlet recently issued by the Agricultural Department gives some valuable information as to flax cultivation. The plant loves a dry, warm, loose soil. Where it is strong and stiff it must be well cultivated, so as to give the roots a free course during the early stages of growth. It matures rapidly in spring, and ripens its seed before the cereals; and, if not assisted in the way suggested, will become stinted and valueless for fibre-making purposes, but will, however, give a fair quantity of seed. Generally speaking, the soil suitable for producing a crop of cereals will do equally well for a crop of seed and fibre, with a slight additional working, as suggested. Wet soils should be

avoided. A free soil is specially valuable, as before sowing the land must be well pulverised. Excellent results may be obtained in the loose mallee lands, when there is sufficient moisture for the growth of the plant. As a rule, it may be said that where a good crop of wheat can be obtained flax will do equally well, though wheat can stand a harder seed bed. In Gippsland and the coastal districts there is less danger of growth being checked in the spring from want of moisture, and there is also a wider range of season for sowing. The seed requires to be kept very close to the surface. About a bushel (56 lb.) to the acre is sown for fibre, and from half to three-quarters of a bushel for seed—generally at the same time as wheat and oats—are sown, in order that the young plants may be thoroughly established, but not too far advanced, before the winter sets in. No danger is to be feared from frost, and, speaking generally, growers are advised by the department to sow during the autumn.

Complete information on these points may be obtained from the Agricultural Department or Messrs. Woolfe Bros., Maffra. A splendid plant for dressing about 4 cwt. of fibre per day and preparing it for market may be erected for a cost of about £70, exclusive of the engine; but for smaller quantities the outlay necessary is purely nominal. The more the possibilities of developing the industry are examined, the more favourable they become. The French Government is giving £1 5s. per acre as a bonus for flax cultivation; Russia, which cultivates more than the rest of the countries of the world combined, is still offering liberal concessions, and in a young country like Australia, with a virgin soil and a superior climate, the cultivation industry should flourish, and by its ramifications into the realm of manufactures provide profitable employment for thousands of workmen. This great branch of industrial effort cannot be overlooked by the Federal Parliament when it comes to revise the strangling tariff.

We would draw the attention of readers of the *Journal* to the articles on "Flax Culture," "Preparing Fibre," Marketing, &c.," which we have published from time to time, especially those in Vol. XII., p. 100, and Vol. XIII., pp. 225 and 311.

INOCULATING A FARM.

Not that a farm is in danger of catching smallpox or diphtheria or any other dreadful thing. Still, soil does get worn out, and needs something to cure it and make it productive again. Therefore, the Department of Agriculture sends out little packages of germs, neatly done up like yeast cakes. When the farmer receives his cake he drops it into a barrel of clean water, turning it milky white. Then seeds of clover, peas, alfalfa, or other leguminous seeds are soaked in it, gaining thereby a remarkable vigour, so that unproductive soil will yield so largely that the farmer hardly recognises his own crops.

We all know that crops of wheat and grain use up the nitrogen in the soil, and while there is plenty more floating around in the air it is no easy matter to capture it. Now, leguminous plants have little bacteria tubercles growing on their roots, and these same tubercles absorb the nitrogen and give it back again to the soil, and thus fertilise it.

Dr. George T. Moore, of the Department of Agriculture, has thought out a way to cultivate these bacteria artificially, in such form as increase and make permanent their nitrogen-fixing qualities. He has patented the invention and generously given it to the American people. Germs enough to inoculate from 1 to 4 acres can be sent in each of these little packages. Only leguminous plants are benefited by these bacteria, and where the soil is rich the crop is not largely increased by the use of these germs, but in barren soil the yield is increased several fold.—*American Exchange.*

Conditions under which the Department of Agriculture will Register Cows in respect of their Milking Qualities.

Some years ago the Department of Agriculture instituted competitions amongst dairy farmers in order to stimulate them to greater endeavours to breed a good type of dairy cows. The conditions of the competitions were that owners of cows which yielded or exceeded the quantity of 1¼ lb. of butter per diem would be privileged to have the animals registered as dairy cows, and the latter would have the Department's brand placed upon them.

Further conditions were, briefly, that each competitor should enter three cows for competition, to be tested on the showground for three consecutive days, and that any cow not yielding 1¼ lb. of butter daily should be disqualified.

At present, however, the records of purebred stock only are registered. It is proposed now to register breeds typical of some well-defined breed of dairy animals with a record of not less than 20 oz. of butter and 30 lb. of milk daily, the animals to be branded with a fire brand on the skin.

With this object in view, a series of regulations has been drafted for governing the admission of cows to the register above indicated. The regulations will contain a proviso that the testing shall be conducted by an officer of the Agricultural Department, or by some competent person appointed by the Department to perform the work.

No animal producing less than 2½ lb. of butter in 48 hours to be eligible for admission to the register.

The direct progeny in the first degree only of any animal registered to be eligible to be recorded in the herd-book, provided that the sire of such animal be of some recognised dairy breed. All animals so registered to be branded with the Departmental brand on a certain portion of the body.

Secretaries of Agricultural and Pastoral Societies and Associations are invited to communicate with the Department on this matter.

Dairying.

KIDS' MOHAIR.

A FEW PRACTICAL POINTS ABOUT THE FINEST MOHAIR GROWN.

By S. B. HOLLINGS.

It is a remarkable fact that if we want the finest, strongest, and best classes of raw material for manufacturing purposes, be it either wool, mohair, or alpaca, we must look to the first shearing for those qualities, for the wide world over the same natural law holds good that the older the animal the worse and more coarse is the product. Nature somehow or other seems to reach its highest state of perfection the first twelve months of its existence, for both in sheep and Angora goats in particular the first fleece is always the best. I remember when but a lad displaying youthful ignorance as I spoke on this one subject with the oldest mohair merchant in Bradford, the late Mr. Thomas Crabtree, and in his fatherly and gentlemanly way he gave me a lesson in sheep-breeding, wool and mohair growing, and the intelligent and painstaking way in which he drove home this first lesson of nature I shall never forget. The fact is remarkable, and the more we think about it the more astounding it becomes, that both a sheep and a goat gives of its best the first twelve months of its existence, and while the second fleece may still leave nothing to be desired, yet it is hardly up to that high standard of perfection that the first is. I remember the time very clearly indeed when in Bradford there was a good deal made of "hogget" wool, and when an old wool-stapler would be certain to inform you that if you wanted to make a first-class piece of cloth it must be "made from hogget wool." There is a good deal of sound common sense in such an assertion, but I am afraid that in these days of hurry and scurry men go at it very strongly, and so long as they can produce an article at a profit they care neither one jot nor tittle what the article is made from providing it yields right. Now, there is something to be said in favour of the first fleece of either a sheep or an Angora goat, but as we are to-day dealing with the latter we must confine our remarks to kids' mohair, what it is, what it is used for, and what it denotes, in the hope of being able to say something alike beneficial to the beginner as well as to the older breeder of Angora goats. I take it that it is the mission of these articles to bridge the gulf between the grower and the user of mohair, and if we can enlighten each other then good is bound to result.

What is Kids' Mohair?

Before we embark on our present expedition, it will be as well to inquire first of all, What is kids' mohair? for, with the numerous definitions that are given to the several qualities and descriptions of mohair, it is at times a little conflicting to know what one means by kids, Cape firsts, Cape winter, Turkey average, and Turkey super, as well as one or two more well-known descriptions of mohair. It will not need much intelligence to understand that kids' mohair is the first shorn fleece from a goat, this usually being taken off ten to twelve months after it is born.

In kids' mohair we naturally look for all good, sound characteristics to be present, and if they are absent in the first fleece they will be absent for ever. This point I will speak about later on, as it is essentially one for the breeder.

Kids' mohair being the first-shorn fleece, the owner naturally looks it over very carefully to see how it comes off the animal, and it is right that he should. Of all fleeces of mohair, that of the kid should rank as excellent, and if it does not then there is something radically wrong, and the sooner the animal is butchered the better. I have seen kids' fleeces of mohair which were little better than an average Cape summer first, and when the same was shown to

the buyer it would only be taken as average mohair, simply because there was not that quality and high standard of perfection that is always looked for in kids' fleeces. Expecting a kid's fleece to be the best that nature can produce, buyers naturally want the best, and if there is only a second-rate quality, a somewhat short staple, lustre deficient, and kemps abounding, then even the veriest tyro knows there is something radically wrong somewhere. I would say emphatically let kids be kids, and not second and third shearing, for it still pays to be honest when selling mohair, like everything else.

WHAT KIDS' MOHAIR IS USED FOR.

Kids' mohair may be called in wool language the "super combing" of the fleece, and as such it always receives the first attention of buyers because of its intrinsic qualities and its being put to a special purpose. The uses to which the first-shorn fleeces of the Angora goat are put centres specifically around the best classes of manufactured goods into which mohair enters, and naturally ladies' dress goods and cotumes are the articles in which kids' mohair bulks very largely. It need hardly be said that the finer the quality the smaller will be the yarn spun. A thick, heavy-fibred fleece will only spin into very thick counts of yarn, suitable only for the plush and braid trades, but when we come to deal with kids' hair this is usually set on one side for the production of yarns for the very best purposes possible. It is unfortunate for several reasons that the "lustre" dress trade is at present so slack, otherwise the trade in kids' mohair would have been in fine fettle, but, black lustres being so flat, kids' mohair is likewise occupying to-day a somewhat weak position. But that fact does not alter the channels into which the article goes, for, even if we have not a big trade in pure lustre goods doing, there is a fair weight of yarns being worked up in conjunction with wool, silk, and cotton. Kids' mohair is essentially a manufacturer's best friend if he wants to produce real tip-top lustre dress goods; in fact, he cannot do without it, and some Bradford manufacturers whom I could name, whose goods enjoy a world-wide reputation, buy mohair yarns of the finest quality which are entirely made from kids' mohair. As a rule, Bradford merchants who make different classes, or rather qualities, throw kids' fleeces into a pile called "matchings," and a spinner wanting the real tip-top article buys this class of material, properly sorted and classed to one quality and length. It need hardly be said that a deficient kid's fleece will be a deficient fleece as long as ever the goat is kept, hence arises the necessity on the part of the goat-breeder to see to it that his kids are first-class stock, and the fleeces they are turning off satisfactory as regards length, lustre, an absence of kemp, and, above all, a good quality. I have heard buyers speak of Cape kids' hair being little better than good summer firsts, and with the verdict there has been a refusal to accept the stuff offered at anything like a kid's price, this meaning a corresponding less figure to the merchant as well as to the grower.

PACKING KIDS' MOHAIR.

Bradford mohair-buyers have long found complaint over the bad methods of packing kids' fleeces in Cape Colony, and while this last few years a vast improvement has been effected, largely through the intelligent and painstaking work of the Mohair Growers' Association, which I am sorry to see is now defunct, there is still room for improvement by the rank-and-file growers in that part of the world. The efforts of many breeders to palm off summer firsts as kids' cannot be said to be a good policy at the best, and I am afraid many a time that a grower has fallen into the trap which he himself had set for the buyer. Packing summer firsts along with kids is a very objectionable policy, because it only drags down the value of the kids to the level of the firsts. Serious complaints have been made by Bradford buyers who have bought Cape kids expecting to find them such, but when they have come to be sorted it has very frequently been found to be a mixture of summer firsts and kids, much to the annoyance of the merchant. I might as well say straight out that

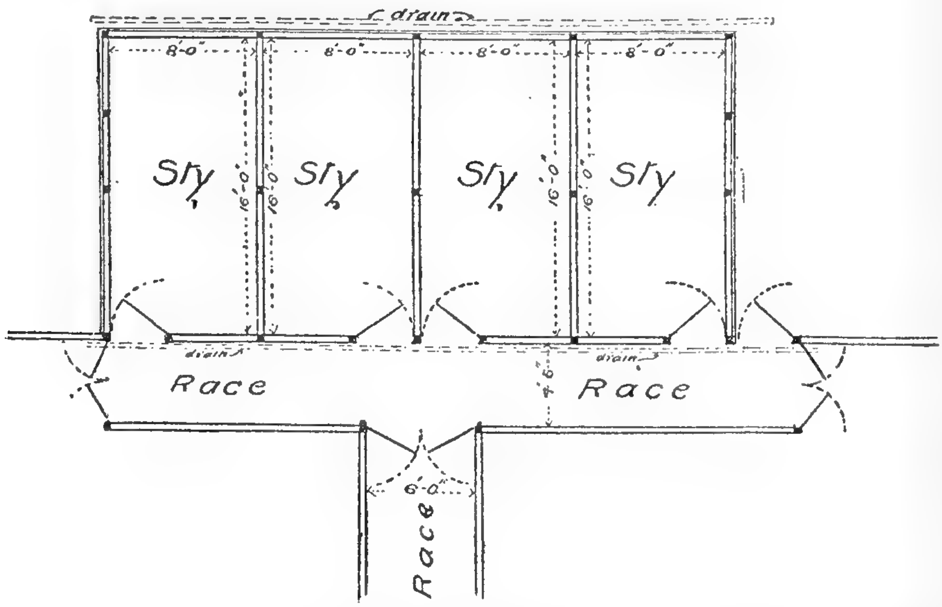
Bradford mohair representatives in Cape Colony have strict instructions to carefully examine all the lots of kids' hair they have offered, and, if they find summer firsts mixed with them, then to pay for the same at a corresponding summer firsts price. Such a policy does not even obtain with the wily Turk, and I would specially draw the attention of mohair-growers in the United States, Cape Colony, and Australia to the evils of falsely packing kids' mohair. There would just be as much sense in packing well-grown lambs' wool with super combing as there is in packing kids' mohair with firsts. Whenever it is done the grower is always a "marked" man, and it simply means that in succeeding years the man who did such a dirty piece of work the season before will not do it again in quietness and peace, and possibly not without some personal financial loss. The Mohair Growers' Association of Cape Colony did very good service in this respect, and I am very sorry indeed that they have discontinued their efforts and dissolved the association. There may be certain difficulties in connection with the sale of their clips which to-day remain unsolved, but if they would have kept pegging away those difficulties would have disappeared, especially if they had had an annual public sale of all the clips in London. However, this is rather a side issue to the packing of kids' fleeces, and I can only suggest to growers the wisdom of baling kids' fleeces to themselves, and selling them as such.

SPECIFICATIONS OF PIGGERIES.

By JOHN MAHON, Principal, Queensland Agricultural College.

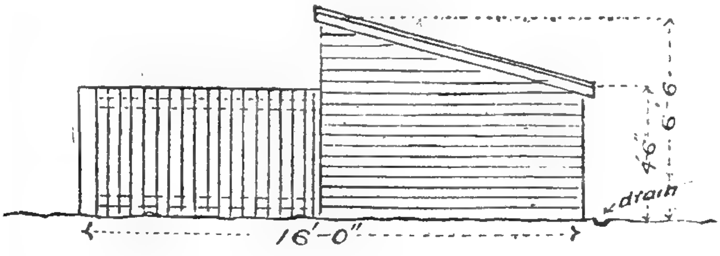
To make a substantial sty, the best method is to use split posts and rails; the latter could be split for about 30s. per 100, and the former for 40s.; palings will cost 4s. per 100 (4 feet long); posts to be 6 feet long and 2 feet in the ground. Dimensions, at small end, about 8 inches by $2\frac{1}{2}$ inches; palings to be nailed inside, about 3 inches apart.

Plan of Sties



Sheds.—Round posts to be used, high posts 10 feet long, lower posts 9 feet, all at least 2 feet in the ground; the back posts to be morticed the same as the split posts for rails, as it is the back of styes. For the roof, if straight hardwood saplings could be procured, they would answer the purpose; if not, two plates, back and front, 4 inches by 3 inches hardwood, and nine pieces 3 inches by 2 inches hardwood for rafters, four pieces 3 inches by $1\frac{1}{2}$ inches for

battens; cover with 26-gauge iron. For open (unroofed) portion, five round posts 7 feet long and nine 6 feet long will be required. The ends to be either weatherboards or slabs.



End Elevation of Sty.

Drains could be made cheaply out of hardwood slabs, the bottom 6 inches by 1¼ inches, the sides 6 inches by 1 inch, well nailed with 2½-inch nails, and let into the ground sufficiently to give a fall.

Race.—The best job would be one made with split posts and rails.

Floor.—A good floor can be made out of any timber, either round or split, with a fall of about 6 inches towards drain.

Gates.—Good strong gates can be made cheaply out of 6-inch by 1-inch hanging stiles, and 3-inch by 1-inch bars, bolted together with 2½-inch by $\frac{5}{16}$-inch bolts. These will be just as strong as any morticed gate. Put a sill between each gateway to keep the pigs from rooting under gate.

Paddock.—To be made with 2-feet wire netting, 3-inch mesh, pig-proof; posts, eight to the chain, 4 feet out and 2 feet in ground; bore 1¼-inch hole in posts level with ground through which to put a barbed wire to keep animals from rooting underneath; bore another ½-inch hole 2 feet from ground, to which to tie the netting, and a third hole 3 inches from top of post; two plain wires with the one barbed will be sufficient.

Trough.—Make out of hardwood, one plank 10 inches by 1¼ inches, the other 11¼ inches by 1¼ inches, both ends on, as nails will be no use for this purpose.

To erect a pigstye and paddock on this plan, there would be only forty morticed split posts required; these would be for the race down the paddock half-way, as shown on the plan. For the styes, sheds, and gates, round posts are required, which will answer as fence posts as well.

Estimate of Cost.

	£	s.	d.	£	s.	d.
Round posts	9	4	0			
Slabs for flooring	2	0	0			
Sawn timber	2	0	0			
Iron	2	10	0			
Split posts (bored), 328... ...	3	0	0			
Split posts (morticed), 40 ...	1	0	0			
Wire netting, 22 rolls	10	0	0			
Rails	2	0	0			
				31	14	0
Labour				10	0	0
				£41	14	0

A piggery of the above dimensions is large enough for sixty pigs, and could be constructed at a less cost than the price given herein if timber is available on the farm, and barbed wire and netting be used for race instead of rails. The best flooring is sawn blocks, standing on end, and well grouted with a mixture of sand and pitch.

WAXED CHEESE.

The Victorian *Journal of Agriculture* publishes the results of some experiments with cheese kept under ordinary conditions in a Melbourne warehouse, with the view of showing the effects of coating cheese with paraffin wax as practised to some extent in Canada. Four small cheeses, weighing $46\frac{1}{4}$ lb., were coated with paraffin wax on 8th October, 1903, and four duplicates of the same weight were left uncoated. The minimum temperature of the store for $14\frac{1}{2}$ weeks was 58 degrees, whilst the maximum was 70 degrees, and the mean 65 degrees. On 19th January, 1904, the cheeses coated with wax weighed $44\frac{3}{4}$ lb., showing a loss of $1\frac{1}{2}$ lb., or 3.22 per cent., whilst the plain duplicates weighed $43\frac{1}{2}$ lb., and lost $2\frac{3}{4}$ lb., or 5.91 per cent., showing a saving of 2.69 per cent. in weight in favour of the paraffin coating. The cheeses coated with wax were adjudged by experts to be superior in flavour and texture to those which were not so treated.

PROFITABLE FARMING.

A truism which we have repeatedly brought to the notice of our farmer readers is that the secret of success in farming lies in quick returns. The one-crop farmer has no constant income, and this is doubtless the reason that so many farmers now go in for dairy-farming. A writer in the *Agricultural Gazette*, London, puts it in this way:—

It is the extreme slowness of the turnover which places farming at such exceptional disadvantage. No other business yields a turnover less than the capital invested, but this is the case to an extraordinary degree with farming. What farmer with £4,000 invested in his farm obtains a gross return of £4,000 a year? And yet what tradesman would be content with a turnover which does not amount to as many times his capital? Live stock, as ordinarily managed, is, no doubt, one cause of slow returns. It is the long period which must elapse before a heifer calf becomes a cow, or a lamb becomes a dam, or a foal becomes a horse. Those who go straight for milk, and buy their cows ready-made, or grow potatoes instead of turnips, or sell crops and buy artificial manures to supply the loss of fertility, have in many cases prospered; while the four-course farmer, who relies on the slow processes of breeding ordinary sheep and cattle, as he did in the days when corn really paid for such expenses, finds it difficult to make both ends meet. Farming suffers from want of elasticity. What is wanted is a system which favours income at all times of the year—not a corn crop which is all realised by the end of March, but sales of potatoes, mangel, straw, hay, milk, corn, pigs, poultry, wool, sheep, &c., supplying a constant income. The problem has been solved by many, who find farming not unprofitable; but the irksome succession of root crops to prepare land for corn, and corn to foul land for roots; of straw crushed down into manure, and manure used to grow more straw; of hay grown for sheep and cattle, and then "back to the land," to grow more hay for more sheep and cattle, resembles the circulation of the blood, it is true, but it is not a circulation from which there is much hope of an outcome for the benefit of the tenant. For farming to be profitable there must be a constant and rapid *outcome*, and this is the reason why milk-selling is in such high favour. It secures a monthly or a fortnightly cheque. So also with potato cultivation; it secures an outcome and an income very different from eating hundreds of tons of hay or thousands of tons of turnips on the land. To convert into money is sound practice, whenever possible, with the result of a fund which enables the enterprising farmer to buy the necessary phosphates, nitrates, potash, or lime requisite for keeping up the fertility of his land.

The Horse.

QUEENSLAND DRAUGHT HORSES.

By "ARAB."

A good deal has been urged of late years against our stock of draught horses as being unfit for town purposes because they are lacking in good action. The present stock are generally described as Clydesdales. This they really are not. It has been claimed that Suffolks would be better suited, as it is alleged they are more active than this so-called Clydesdale stock. The stock complained of are really not Clydesdale, but a mongrel crossbred stock, which has lost all Clydesdale quality and merits. The use of Shire blood is responsible for this in our local bred stock, and the draught entires being imported in numbers from Victoria and called Clydesdales are no more typical Clydesdales than are the draught stock to be seen in Brisbane lorries, and which it has been advised to displace by the use of Suffolk.

In Queensland we have stallions which give us half a century's experience with Suffolk and their crosses. I have had this stock under observation for over thirty-five years, and about two years ago bought several head out of this herd. The breeders had crossed with Shire on the original Suffolk stock—with most unsatisfactory results. The Shire had imparted a more deliberate or slower style of stepping than that of the quick-stepping Suffolk, but the toddling short stepping of the Suffolk was retained, and the result was that no means of persuasion could get a walk of 3 miles an hour out of any of them. The Shire is not a quick stepper; the Suffolk is not an effective one. The typical Clydesdale is both an active and effective stepper, hence his great value and superiority. For many years the good action of our draught stock has been impaired by the introduction of Shire blood, and it cannot be improved by imparting the Suffolk's toddling stepping with its lack of effective reach. To advocate this as a means for improving the action of our stock, saddle or draught, is simply a fallacy of faddists.

TO REMOVE WARTS.

Warts, like freckles, are largely the concomitant of youth, and usually vanish with advancing years. You can readily remove the warts on your hands without cutting and without making the hands sore. Do not pick or in any other way cause such excrescences to bleed, for this will increase the disfigurement, and will neither retard the growth nor hasten the removal of the wart. An excellent solution which will remove the warts is made by putting a lump of common washing soda, the size of a walnut, in a 2-oz. bottle filled with cold soft water. Cork the bottle carefully, and do not fail to label it. When the soda is dissolved, moisten the warts thoroughly several times each day with the solution, and they will gradually disappear. If the tips of the warts are very hard, file off the calloused skin with a nail file; this will allow the soda solution to penetrate more readily, and hasten the removal of the wart. Warts of but a few weeks' growth will vanish completely after a few applications of the soda solution. Should the surrounding skin become sensitive, bathe with a little sweet oil or cold cream. By exercising a little care, touching only the warts, and keeping the skin soft, not even a tiny scar will remain after the treatment recommended.

The Orchard.

IMPROVED FRUIT CASES.

By ALBERT H. BENSON, M.R.A.C.

During the last two seasons Californian fruit shippers have been sending perishable fruits, such as plums, pears, apricots, peaches, and grapes to Australia, some of which have reached this State. The grapes were seized, as their importation is prohibited; but before being destroyed were, fortunately, photographed. All the fruit that I have seen is in excellent condition on arrival, and this is entirely due to the great care taken in handling and packing. The method of packing employed and the cases used are valuable object lessons to our fruitgrowers if they would only take them, as they show us the possibility of sending similar fruits grown here to more distant markets than those we are at present able to secure, through inability to get our fruit to carry to such markets. Given the right kind of packages, as used by Californian growers, I see no reason why the plums and peaches of the Stanthorpe district and the grapes of our Southern and Western districts should not reach our Northern markets in the best of condition, and practically without loss, or why our early grapes should not carry in good order to southern markets. I have mentioned this matter of using improved cases many times when addressing fruitgrowers throughout the State, and both in the *Agricultural Gazette of New South Wales* and our own *Journal* of agriculture I have for years past advocated the use of a similar package for grapes, apricots, early peaches, and plums to that in which the grapes recently reached here from California. In the October number of this *Journal* I was glad to see Mr. Jones's note on this important matter, and am glad that photographs of the cases described by Mr. Jones were made by our artist, Mr. Mobsby, as they are available for this article, and will show better than any words of mine exactly what is required.

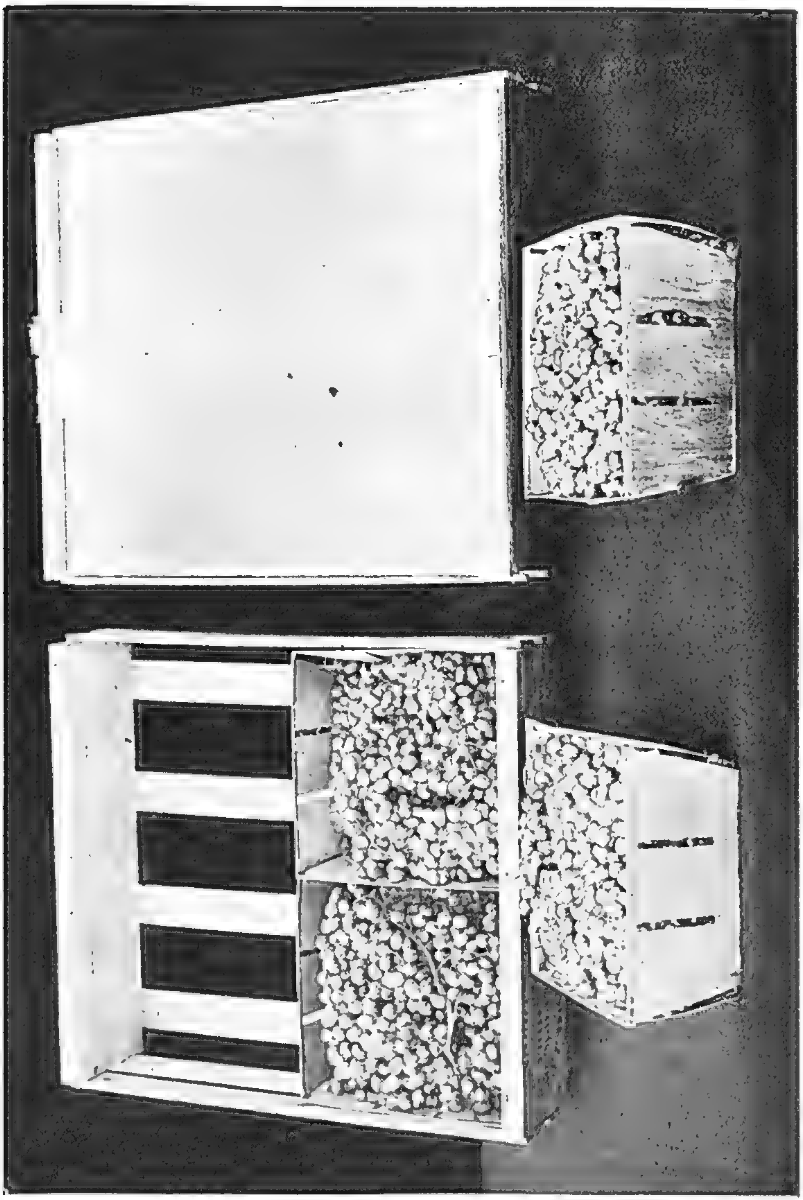
The grape case, or crate, holds four baskets, each of which is made of two slices held together by a narrow rim of channeled tin. Each basket holds 5 lb. of fruit, the crate thus containing 20 lb. This crate is used in California for grapes, plums, apricots, early peaches, winter tomatoes, loquats, &c. Fruit packed in such a crate is never crushed, cannot sweat, and consequently carries better and longer.

The cost of the slices in the flat ready for putting together for making the 5-lb. tin-top grape baskets in Tacoma, Washington, U.S.A., is from 6s. to 9s. per 1,000 baskets of two slices each. The cost of the finished baskets is, however, from 28s. to 32s. per 1,000, or at the higher price four-fifths of one halfpenny each, and I estimate that they could be landed and sold here at ¾d. each, or at 3d. per crate of four. The cost of the crate in the flat at Tacoma is 2⅛d., or about 3d. landed here, or 6d. in all for four 5-lb. baskets and crate to hold 20 lb. of fruit. If the slices were made into baskets locally, and the crates were made locally, the price should be reduced.

The making of the baskets from the slices requires two machines, one to put on the tin tops, worth about £6 in Tacoma, and another to channel the tin strips, costing about £50 in Tacoma, so that if the manufacture of the baskets is undertaken locally the initial expense will not be great.

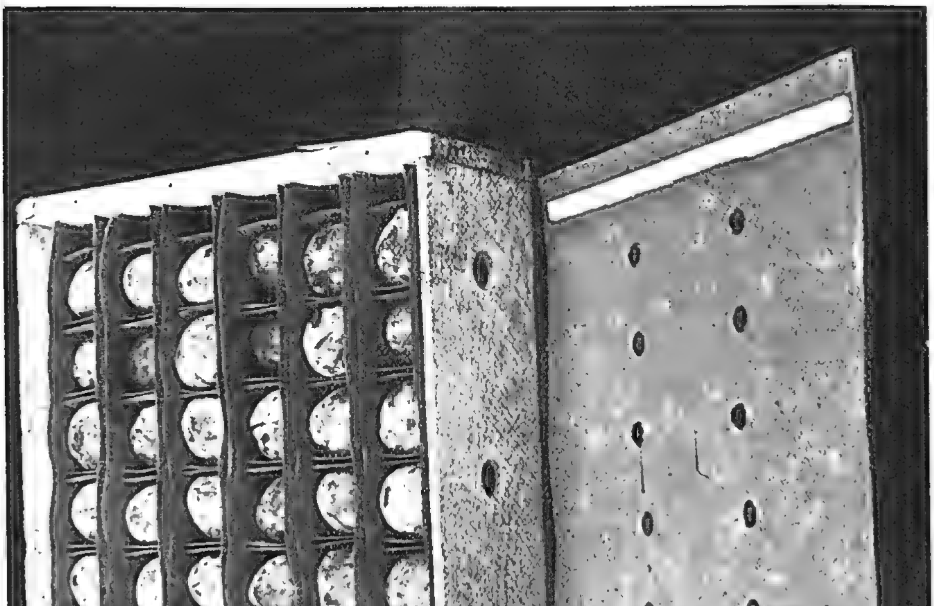
The grapes shown in the illustration reached here in excellent condition, also the plums. The method of packing the latter is hard to beat, and should pay in the case of our best peaches for a Northern market. I have not full particulars of the cost of the case used, but it should not exceed 3d. without the cardboard. I am glad to say that this Department sent some time since

Plate XIII.



GRAPE CASE AND BASKETS.

Plate XIV.



PLUM CASE.

for a quantity of baskets and crates to Tacoma, with which we will test the carrying qualities of some of the fruit grown at our State Farms this season, and fruit grown privately in several parts of the State will also be tested.

This should give growers a fair insight into one of the Californian methods of handling fruit, and will, I trust, lead to our growers following their example and thus extend our present markets.

Grape Cases.—Inside measurement, 16 by 16 inches, 5 inches deep; 8 strips, $1\frac{1}{2}$ inches wide by $\frac{1}{4}$-inch thick, are spaced so as to construct the bottom and sides of the case. The lid consists of 2 pieces of $\frac{1}{4}$-inch by 8 inches, with 2 strips $17\frac{1}{2}$ inches by $\frac{1}{2}$-inch across the ends. This case holds about 20 lb. of grapes.

Plum Cases.—$16\frac{1}{2}$ by 12 by 4 inches inside measurement. The ends are made of $\frac{5}{8}$-inch thick wood, the sides of $\frac{1}{4}$-inch stuff, with 4 holes $\frac{3}{4}$-in in diameter bored in each piece.

The fruit is placed in card sections of 54, with $1\frac{3}{4}$-inch spaces, two layers of fruit in each box. Between each layer is placed a perforated card-cover, having 4 $\frac{1}{4}$-inch square strips fastened to it to prevent contact between the upper and lower layers of fruit. This case carries 108 plums held in the section, with no contact with any other fruit.

Horticulture.

AN OLD STRAWBERRY REVIVED.

Mr. Foreman, of Helena street, Paddington, states that he is growing a most delicious variety of strawberry at his gardens. The plants have been in his possession for over fifteen years, and were obtained from an old Kentish gardener, who imported the plants from England twenty-five years ago. Mr. Foreman also says that he has received letters from Lady Lamington and Lady Chermside, testifying to the excellent flavour of this strawberry, which is equal to that of the home fruit. The berry is large, and of a beautiful colour, and we have no doubt that those who have tasted them find the "Foreman Strawberry" all that is claimed for it.

ENDIVE AND LETTUCE.

Endive is an extremely useful salad, very easy of cultivation. When lettuce refuses to heart because of temperature, then endive comes in as a valuable substitute. The great secret of success with this plant is to secure perfect etiolation. Unless the heart is thoroughly bleached, so that the green leaves in the middle become of a pale primrose colour, the proper end has not been achieved.

There is a strong bitterness in the unbleached foliage, which only disappears after being hidden from the light for several days.

As endive can be planted twelve inches apart either way, it is called a foot crop, and a small plot produces a quantity of stuff. In bleaching endive, it may be matured by closing the top of the leaves with a strip of raffia, so as to shut in the middle, or by laying a flat tile on the plant. The latter method is followed more on the Continent, and, as it excludes light, air, and rain, it produces a like effect to tying up.

Apiculture.

THE APIARIST'S ALPHABET.

By "BUSY BEE."

A queen should be a good layer.
BB are best kept strong.
C that worker eggs are in combs.
Destroy all bee moth signs.
Extract honey from sealed combs only.
Fertile workers only produce drones.
Get good queens.
Hives should be weather and bee proof.
Interest yourself in bee culture.
Join weak colonies.
Keep your weather eye open for swarms.
Light your smoker well before operating.
Many bees, much honey.
Never mind the stings when working.
Only look at bees during fine weather.
Pay attention to queen cells.
Queen cells mean swarms.
Render all broken comb and cappings into wax.
Stings, they say, are good for rheumatics.
Too many drones eat the honey.
Unless you are smart swarms will depart.
Veils are necessary to protect the face.
Wax is the worker bees' building material.
Xerxes and box hives are out of date.
Young queens lead out after swarms.
Z is the bee alphabet all zaid.

PRESERVATION OF MEAT—AN INTERESTING DISCOVERY.

A very interesting discovery, which may have a great influence on one of the staple industries of Queensland, is said to have been made by Mr. Ivar F. Witting, graduate of Alnarp Agricultural College, Sweden, and at present residing in Queensland.

Mr. Witting, we are informed, has discovered a very simple and cheap method for destroying the bacteria which cause the decomposition in meat, and thus preserving the meat for unlimited time. The real nature of the discovery is not yet made public, but so much is, however, known that neither freezing, cooking, nor fumigating is required. The taste and succulence of the meat and its nourishing properties are not in any way affected.

The influence this discovery may have on the meat export trade is without doubt great. It is not long since Mr. Witting discovered a method for the total destruction of bacteria in milk and the preservation of the milk in its original state for unlimited time. This idea has been patented, and a company to work it is under formation.

Tropical Industries.

AGRICULTURE IN THE BAHAMAS.

A United States consular report says that during the year there has been a marked increase in the quantity of sisal temp produced, and that the industry will continue to prosper. Up to March, 1904, over 100,000 dollars worth (£20,000) was exported, chiefly to the United States.

Although considerable is done in the way of agriculture, there is little in the sale or use of machinery, the soil being altogether too rough and rocky. The implements in use are of an old-fashioned kind. Queensland farmers should note that on this rocky, rough soil, the sisal hemp industry is prospering. The export value of £20,000 represents 571 tons at £35 per ton.

TOBACCO NOTES.

By R. S. Nevill.

The following is clipped from the *Western Tobacco Journal* of 19th September, 1904:—

ABANDONMENT OF CONNECTICUT.

Experiment of Growing Shade-grown Sumatra.

A bird's-eye view of the Connecticut Valley in 1902 and 1903, says the *Springfield Republican*, shows a remarkable change in 1904. The white tents which dotted here and there the green valley between Hatfield and Hartford have been silently folded away, and the raising of Sumatra tobacco under shade is to-day largely a matter of history, and a subject of further experiment. It is estimated that between 800,000 dollars and 1,000,000 dollars have been lost in this venture. In 1902, 700 acres were planted under shade, but this year only a few acres are still being experimented with by a small minority.

The experiment of shade-grown tobacco was first tried in the Connecticut Valley in 1900, on a third of an acre of a Poquonock farm at Windsor, by Professor Milton T. Whitney, Chief of the Bureau of Soils of the Agricultural Department, in connection with the Connecticut Experiment Station. In 26th December, of that year, a bulletin posted by the Secretary of Agriculture at Washington, said:—

"The crop has just been sold for 473.70 dollars, making an estimated value for 1 acre of 1,421 dollars. The cost of production, including the whole cost of the shade—the frame for which will last five years—will not exceed 500 dollars an acre, leaving a net profit of over 900 dollars per acre. This was an average price of 71 cents per lb. . . . The Sumatra tobacco grown under shade has been submitted to New York and Philadelphia businss men, and has been pronounced entirely satisfactory and fully equal to imported Sumatra."

To all those familiar with the American tobacco market, among whom, of course, were the tobacco farmers of the valley, this was a statement of the most sensational character. The farmers thought immediately, and very naturally, of the 6,000,000 or 7,000,000 dollars which is annually sent to Holland to buy the choice tobacco of the island of Sumatra, obtainable nowhere else, and on which there is an importing duty of 1.85 dollars per lb. If, as the bulletin posted asserted, it was possible to raise Sumatra tobacco under shade in the Connecticut Valley fully equal to the imported Sumatra, these millions would in the future go into the pockets of the American tobacco grower. This was one of the very facts which the bulletin announced to the world. Attention was also called to the award of two points for Florida-raised Sumatra over that given for the real imported Sumatra at the Paris Exposition, which showed to the satisfaction of the Department of Agriculture that "we can grow tobacco

of the highest quality in this country." This short, concise bulletin, posted at Washington, went on to compare the profits of raising tobacco in the regular way with Sumatra tobacco raised under a tent. A crop grown in the field, said the bulletin, without shade and fermented in the same way, yielded about the same quantity, and brought 27 cents a lb.—a profit of 300 dollars per acre. The ordinary crop in the Connecticut Valley brings the farmer about 20 cents per lb., or 360 dollars per acre, and, deducting the cost of expenses, leaves a profit of about 260 dollars an acre. Shade-grown Sumatra tobacco, the bulletin already quoted had said, would yield a net profit of 900 dollars per acre.

Wide interest was at once shown in this agricultural experiment, and promoters found little difficulty in securing capital to start companies in the raising of shade-grown tobacco. Two seasons of bad weather and dull markets have swept most of these companies from the tobacco fields. The shade-grown Sumatra of Connecticut had too many flaws in it. The leaf is said to have lacked elasticity, that it is dull in colour and green, and that its aroma when used in wrapping good cigars is undesirable. Cigar manufacturers bought small quantities for trial, but with unsatisfactory results, and the consequence is there is no market at present for Connecticut shade-grown Sumatra.

WATTLE BARK.

In consequence of the splendid growing seasons which have prevailed since the break-up of the great drought, the prices for all kinds of farm produce except sugar and a few other staple products have fallen below a remunerative figure. Farmers must live, but how are they to do so, unless either a better market is found for their produce, or some product is introduced which will always be to them a stand-by in any kind of season? To assist them in this matter has of late been the earnest endeavour of the Department of Agriculture, mainly in the direction of an oversea market. To this end not only samples but even small consignments of wheat, barley, fruits, &c., have been sent to England and the East, and the results, with the exception of a shipment of maize to Vancouver, have proved very satisfactory. In the United States the Queensland barley excited the greatest admiration, and there appears to be little doubt of a market being found for both malting and grinding barley at very remunerative prices. Even the maize shipment, which was returned to Australia owing to the presence of a few weevils, was sold in Sydney at within 1d. per bushel of the highest-priced maize in the market. Now we have reason to believe that the cotton-growing industry will revive in the State, and that hundreds of farmers will grow cotton on a small scale. Another valuable product which has attracted considerable attention, especially in the North, is sisal hemp. Of this plant there were only 14 acres planted in the whole State last year. Before the end of the current year there will certainly be over 200 acres planted. Of these two staples, sisal hemp is subject to least fluctuation in price, and the demand every year exceeds the supply. It will grow on the waste, dry, rocky ridges of the farm where no other crop can be produced. It requires little, if any, attention during its life, and the hemp can be extracted by very simple and cheap machinery. These may be called imported industries. There is one, however, which is purely native—that is the production of wattle bark. No one, who has travelled over Queensland with his eyes open, can have failed to be struck by the large areas covered with wattle-trees of various descriptions, all containing more or less tannin. These trees affect dry, rocky ridges, or dry, sandy level country. In favourable situations they attain very large proportions, and not only do they thrive on the Southern coast lands, but they are even more numerous on the ranges inland and on the vast Western wooded plains. They thrive in all parts of the State, and it is safe to say that there are millions of tons of valuable bark only awaiting the stripper to be turned into hard cash. What is now being done in the case of the once-despised mangrove-trees, which line our coasts, may be done with infinitely more ease and comfort in the case of the wattle-trees.

In proposing any new industry to be taken up, there always arises the doubt as to whether it will pay or not, and it is quite right that this vital point should be looked to before it is taken up. In the case, however, of the wattle-bark business, all doubts on this point have long ago been set at rest. It is no new industry, but has been carried on fitfully for many years past in this State. Still, no plantations have ever been formed here as in other States of the Commonwealth and in New Zealand. It will, therefore, not be out of place to place before our readers the possible advantages to be derived from forming wattle plantations on lands which will certainly never be utilised for any other purpose except grazing or the planting of sisal hemp. With this object in view, we will discuss what is being done in the way of wattle cultivation in New Zealand, South Australia, and Natal.

In the former colony there is a wattle plantation at Wairangi, which was described some time ago by Inspector Clifton, of Auckland. He said that the usual procedure in forming a wattle plantation was to fell and clear the scrub, plough and work down roughly with disc harrows, and sow during the month of October. The seed is scalded, and sown at the rate of 1 lb. per acre, or, better still, drilled in at the rate of $\frac{3}{4}$-lb. of seed with 1 cwt. bonedust. Trees so treated are, at two years, equal to those of four years' growth sown without manure.

The cost of wattle planting may be estimated as follows:—

	£	s.	d.
Clearing and burning, per acre... ...	0	7	6
Ploughing	0	7	6
Disc harrowing, one stroke	0	1	3
Sowing	0	0	9
Seed, 1 lb.	0	2	0
Harrowing	0	1	0
Total	£1	0	0

To this, with advantage, may be added—

	s.	d.
Second ploughing, at 6s. per acre ...	6	0
Bones, $1\frac{1}{2}$ cwt., at £5 10s. per ton ...	8	3
Total	14	3

The returns may be estimated at—

	£	s.	d.	£	s.	d
Per acre—10 tons of green bark = 5 tons dry, at £5 15s. per ton				28	15	0
Expenses—						
Shipping 10 tons, at £1 per ton	10	0	0			
Weighing, carting, and storing 10 tons, at 2s. 6d.	1	5	0			
Railage, about 5s. on 5 tons	1	5	0			
				12	10	0
				£16	5	0

From this has to be deducted rent, interest, &c.

Wattle-growing in New Zealand for the production of tanning bark occupies an area of about 4,500 acres in the Auckland district. The Black Wattle (*Acacia decurrens*) is the only variety planted.

Wattle plantations do not increase greatly, mainly owing to the length of time which elapses before a full return can be obtained. There are, however, many settlers in Queensland, who have from 5 to 500 acres of poor open land, where scarcely any clearing is needed, and on which they might in spare moments put in a few hundred trees which would come in to benefit some members of the family. We know of farmers who have occupied their land now for

nearly forty years, and the portion of hungry, waste, untouched land lies hungry and waste to this day. Had this been planted ever so roughly with wattle-trees of the right kind, they would have been enjoying an income of at least £10 per acre for thirty years, and at the old prices that income would have reached £30 per acre.

At Lucindale (S.A.), Mr. Newman said he had great confidence that this could be made one of the most profitable industries of the district, as the soil, climate, and the facilities for delivering the bark at a seaport are all that can be desired. He saw part of a plantation east of Adelaide stripped; the yield being 4 tons per acre, and enough small wattles being left to make another good yield in two or three years' time. The price obtained for the bark was £5 5s. per ton in the field; the price paid for stripping was £1 5s. per ton, which included cutting the trees down and packing them in heaps; the landowner receiving £4 per ton clear, equal to £16 per acre. The land was of poor quality, being very stony and sandy. During the past ten years he had experimented in wattle-growing in this district, and proved that they can be grown on almost any land that is over 3 feet above the level of the winter flood waters. A few months ago he stripped a wattle seven years old that gave over 1 cwt. of bark fit for market. Trees of that size standing 20 feet apart each way would give over 5 tons per acre. That tree was grown on a limestone ridge (red soil), and he had them of nearly equal growth on the fern hills (white sand). As there are thousands of acres of open fern land in that district almost useless for grazing, and eminently suited for wattle-growing, he would strongly urge leaseholders to give that industry a trial. Such land is leased at from ½d. to 2d. an acre annually. About four years ago he planted 1 acre of fern land, and now estimates the wattles on it to be worth £8 to £10. Although the wattle has never been systematically cultivated at Mount Benson, in the Kingston district, still it grows there over a considerable area, and last season no less than 1,200 tons of bark were stripped and sent to market, the price received ranging from £3 15s. to £4 per ton; and as stripping costs £1 per ton it means £1,200 being distributed amongst the labouring classes of the district, and about £3,500 amongst the landholders and teamsters. The bark grown at Mount Benson is deficient in tannic acid, consequently a lower price has to be taken. Where only a small area is to be planted, he found the following a good plan:—Commence at one side of the field, using a double-furrow plough, strike out the length of the piece to be planted, then mark out back again parallel with the first furrows and about 8 feet away from them, and so on through the field. Then take 1 lb. of good seed for each acre, place in a vessel and cover with boiling water, and allow them to soak for twenty-four hours, then drop them regularly along the ploughed strips and cover with a harrow. The next year it will be necessary to thin out the plants in the rows to the required distance. Where large areas are to be cultivated, it would save time and labour to have a box fitted to the back of the plough with a roller through it, and worked by a belt with the near wheel, and so made to drop a seed or two at each revolution, and a small harrow attached would complete the planting in one operation. One team should do 8 acres a day. About every 5 chains it is advisable to leave a strip 16 feet wide unplanted for the purpose of drawing furrows in summer to check a possible fire, and later on as a roadway for carting out the bark. He could not recommend broadcast sowing, as there is so much more labour in ploughing all the land, and the work of thinning out the young plants is very much greater. He would strongly advise that only seed of the true broad-leaf wattle should be planted, as it is doubtful whether it will pay to grow any other variety, the bark of which will be worth quite 20 per cent less. Horses may be allowed the free run of a wattle paddock, but cattle should be kept out altogether, and sheep should not be allowed in until the tops of the plants are out of reach, as they are very fond of the young shoots. He felt certain that if the bark had no market value it would pay well to plough fern hills, and sow 3 or 4 lb. of seed per acre broadcast, and keep all stock out for three years, by which time the wattles would provide a very large amount of feed for either cattle or sheep.

Dobbie's Wattle-barking Machine.

This lately invented machine readily strips the trees close up to the leaves, far higher than could be stripped by hand. The speedy operation of the machine shows to special advantage on wattles from the thickness of walking-sticks up to 3 inches in diameter, indicating that where the crops of wattles were so abundant as to require thinning out, and were too small to strip by hand, it would pay to use the machine. It has been regarded as being quite evident that the machine would reduce the cost of stripping by at least 25 per cent. Moreover, by using the implement, stripping could be commenced much earlier and carried on much later in the season than is possible by hand. The machine itself has the appearance of a substantial roller mangle, the rollers being either metal or covered with metal. One man can carry out the whole of the operations; but it would apparently be still greater economy for two or even four men or boys to operate in conjunction with one another. In using the machine the wattles pass between the revolving rollers, thus receiving pressure upon two sides, which cuts top and bottom, and causes the bark to spring from the complete circle of the stem in two halves. It would appear from this that a very valuable addition has been made to the wattle-bark industry.

WATTLE CULTIVATION IN NATAL.

A correspondent of the *Tropical Agriculturist* of Ceylon gives some very interesting details of the progress of wattle-growing in Natal, which we here place before our readers. He also makes inquiry as to how the variety of wattle *Acacia decurrens* thrives in Ceylon, which information is supplied by Mr. W. Nock, late superintendent of Hakgala Gardens. It appears that the industry is a very remunerative one in Natal, in the Midlands. Wattle bark, there, ranks third among the staple exports of the colony. Several companies are investing capital in it—planting out large areas.

Figures taken from the *Natal Agricultural Journal* for January of this year show that, though the industry is only twenty years old at present, there are over 25,000 acres under black wattle in Natal, and new companies are laying down plantations at the rate of 1,000 acres a year each. In 1902, 15,537 tons of bark, valued at £74,554, were exported. I venture to think that black wattle culture should pay as an industry in the lower moist hill zone of Ceylon, on the patanas for instance, if the soil is not too shallow.

We referred our correspondent's remarks to Mr. W. Nock, late superintendent of Hakgala Gardens, who was just about to leave the island, and he wrote in reply:—"Mr. A. J. Kellow, of Albion, can tell you all that is known about it. He has supplied large quantities, and I believe he got Rs. 140 per ton. There is no question about its growing well in the upper hills, say from 3,500 feet upwards. The difficulty is the transport, and unfortunately the local demand is not great; though with such a price as is quoted above there is a good margin of profit."

Mr. A. J. Kellow, to whom we next applied, is good enough to permit us to reproduce the following estimate prepared by him a couple of years ago. He writes:—

The accompanying estimate for planting up and bringing to the eighth year of 100 acres of *Acacia decurrens* provides for harvesting the whole plantation in one year; if, however, it was found advisable to secure a crop earlier, it could be done, either by thinning out or by stripping 20 or 25 acres at five years old; if the latter course was adopted, the same ground could be replanted with the same product, at less cost, and with the soil very much improved.

Harvesting.—This item—*i.e.*, Rs. 20 per ton, is what it actually cost me here for stripping, chopping, and drying. I cut it into half-inch lengths to suit the local market, but I believe it is not the custom in other bark-producing countries to chop so small, and probably a saving might be effected by using a mill or machine instead of chopping by coolies.

Railway freight is very high, being the rate fixed for Cinchona bark, and Government might be induced to lower it to foster a new industry.

Value of Bark.—I have put down at £6 per ton in Colombo for export; the present rate in Durban, South Africa, is, I am informed, £6 10s.; locally, I have realised Rs. 140 = £9 6s. 8d. per ton (in Colombo).

Average yield per tree I have taken at 28 lb. as a safe estimate, individual trees here at eight years having yielded more than double that quantity.

Cost of land has not been taken into consideration, as it is hoped that the Government will see its way to give a free grant of, say, 1,000 acres to encourage a new product for the hill country, and which would eventually bring a large traffic to the railway in the shape of bark and firewood. Failing a free grant, a lease might be obtained for, say, ten or fifteen years. The Australian rate for Crown lands leased for wattle cultivation was in 1891 4d. per acre. At that rate, the rent for 100 acres for eight years would amount to Rs. 200.

Locality.—In order that the experiment should have a fair chance of success, the locality chosen should be between the Ambawella and Nanuoya Stations in one block, above the railway line for facility of transport, and should include a proportion of jungle land for the supply of fencing posts, &c.

Funds.—A syndicate with a nominal capital of Rs. 100,000, with a paid-up working capital of Rs. 20,000, would be required to start the enterprise, say in 1,000 shares of Rs. 100 each.

Estimate for clearing and planting with *Acacia decurrens* 100 acres, each acre carrying 1,200 trees 6 feet apart = 120,000 trees, weeding for two years, probable yield and cost of harvesting:—

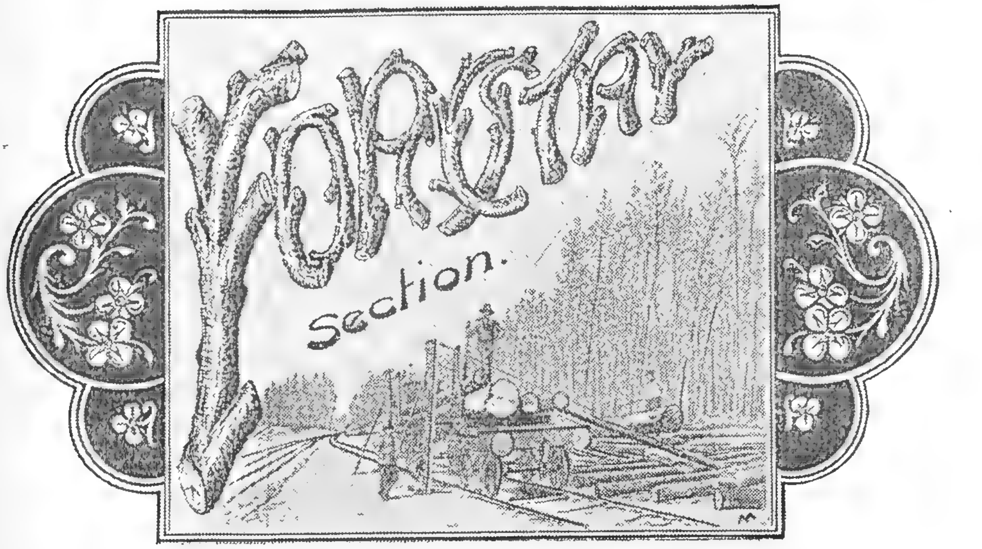
	Rs.
To clearing 100 acres at Rs. 20 per acre	2,000
,, Lining 6 × 6, holing, planting, and shading at Rs. 10	1,000
,, Nursery, including cost of 20 lb. seed	500
,, Weeding first year, at Rs. 1.50	1,800
,, Tools, Rs. 200; lines, Rs. 200; roading, Rs. 160; fencing, say Rs. 1,000	1,560
,, Supervision, first year	2,000
,, Second year's weeding at Rs. 1.25 = Rs. 1.500; supervision and manuring, Rs. 1,000 ...	2,500
,, Second supplying vacancies at Rs. 3... ...	300
,, Supervision and watchers for five years, at Rs. 1,000	5,000
,, Unforeseen expenses, repairing lines, fence, &c.	1,340
Showing an expenditure to end of seventh year of ...	Rs. 18,000
To eighth year, temporary lines, bark shed, &c. ...	2,500
,, Stripping, chopping, and curing 1,500 T. bark (= 28 lb. per tree from 120,000 trees), at Rs. 20 per ton	30,000
,, Cartage to railway station, at Rs. 2	3,000
,, Railway freight on 1,500 tons, Nanuoya to Colombo, at Rs. 25	37,500
	Rs. 91,000

CR.

By 1,500 tons bark at £6 per ton in Colombo, £9,000, at Rs. 15		135,000
,, Value of 120,000 trees for fuel, at 50 cents each		60,000
Balance, profit	104,000	
Total	Rs. 195,000	195,000

A. J. KELLOW.

Albion, Nuwara, Elliya, 17th March, 1902.



CONDUCTED BY PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

THE FOREST.

(A Preliminary Lecture delivered to the students of the Queensland Agricultural College.)

By PHILIP MAC MAHON.

(Continued.)

Now you see that forestry, in its widest and commercial sense, is something more than the propagation and growth of trees, that it involves, in fact, quite a number of operations not necessarily connected with tree-growth at all. Let us glance at these. The training which a man receives in an institution like this fits him in a large measure for the active practice of a forester's life. I would not ask better assistants for a really effective scheme of State forestry than the young men who have been through a course of the education you are receiving here. The man who would be of service in national forestry will have to deal with tree and plant growth in many phases, and a knowledge of plant structure is indispensable to him. The laws which govern plant growth he must also be familiar with. He must know a good deal of the geographical distribution of plants, and it will be better for him if he has had as much acquaintance as possible with plants and trees in their native homes. He must have a fair knowledge of mathematics. Questions of the quantities of timber on large areas, the increment thereof according to ascertained laws of growth, and many other questions have to be constantly worked out by the man who would succeed. He must have some knowledge of the chemistry of soils, and a general knowledge of geology. You will see that he will be constantly dealing with soils of varying constituents, and though no one expects the forest officer to be an analytical chemist (and if he has been looking after the more important parts of his work he will never have had time to be anything of the sort), still he will find a general knowledge of these two subjects of value to him.

In every country where forestry is carried on systematically, a general knowledge of the law of that country is considered part of the equipment of the forest officer. There are questions of law constantly arising in connection with forest work when undertaken by the State; and, although a man who is his own lawyer has a fool for his client, a knowledge, acquired from reading of the laws of the country to be operated in, prevents many blunders which would otherwise take place. So important is this matter regarded in India, that a book of considerable size has been written on the subject of forest law by B. H.

Baden-Powell, C.I.E., consisting of a series of twenty-seven lectures delivered to the students of the Government Forest School, London.

It will strike you at once what an important part climate plays in forest work. I have kept clear, and mean to keep clear, so far as I can in these lectures, of the often debated subject of the effect of forests on rainfall. It is hackneyed, and is not susceptible of the mathematical proof which I seek in matters of this kind. I allude more especially here to the effects which climate has upon the forests themselves. At Yandina, the Bunya Mountains, and the Condamine, in the same latitude, you have three very distinct classes of tree growth. How much of this variation, and what part, is due to climate? How much to variation of soil? How do altitude and exposure affect the general result? What are the climatological conditions of the three places? And, with a view to the introduction of exotic trees, what other parts of the world correspond most closely to these three climatic areas? You will note that the forester must not only know something of the mere recording aspect of climatology, but he must be able to draw deductions from recorded results. I produce for your information a rainfall map of India, also a chart of the distribution of forests under the control of the Forests Department in that country, by way of illustrating *en passant* the relation between the monsoonal rains and forest distribution.

Botany is a necessary accomplishment to the forester, not in the dry-as-dust sense, but in so far as it relates to the broad distinctions between different sections of the vegetable kingdom, their analogies, relationships, and uses.

The forester has much to do with maps. He must be able to read them; to determine, on the ground, any line laid down in them; to construct them if necessary, and he is frequently called upon to make plans and maps of greater or less area, and to determine their superficial contents with accuracy and despatch. He must be able to lay off the areas or blocks provided for in his working plan when this prescribes that the forest or any portion of it shall be worked in rotation blocks. Thus it will be seen that he must be a surveyor. All the above, together with other purely educational studies, are imperatively required in the Indian Forest Service, together with experience of actual forest operations. From what I have just said you will see why I regard this as a peculiarly appropriate place to endeavour to create an interest in forestry amongst the pupils. You are learning from other masters many of the very things which the forester needs for his full equipment. The importance of the forestry question is so great for this continent that I trust I am not too sanguine in hoping that we are within measurable distance of the establishment of a national school of forestry, and that the action of the Minister in establishing these lectures will be followed in other States and tend to the formation of an enlightened public opinion upon the subject.

Although the Minister's action is the first of the kind in Australia, you will observe, from the list of colleges and institutions holding classes in forest science in the United States, that the importance of the subject is being grasped by our go-ahead cousins over the way.

Queensland is a country where every boy carries a Premier's portfolio in his school-bag. In the not unlikely event of some one of the young gentlemen now honouring me with their attention ruling the destinies of the State, I hope he will attribute the lively interest which I foresee he will take in the afforestation question to these little chats of ours.

A tree. What is it? The word tree usually calls up to the mind's-eye a noble object standing in a plain, crowded with spreading boughs from base to apex, its widely extended branches giving shade and shelter from the noonday sun, and its leaves spread in the free air of heaven, a thing of beauty and a joy for ever. Now, to the forester, that is not a tree! It has no place in his calculations. He admires it, for he loves Nature in all her forms. It is an expensive jewel that glitters on the breast of Nature, and makes us frame excuses for its comparative uselessness in regarding its exquisite beauty.

The trees which delight the forester's heart are those which stand like the stalks in a field of waving corn—clean, bolt upright, straight, and symmetrical as the shaft of a lance. As many of them on the land as the land will hold, according to their species. Their heads away in the upper air, anywhere over a hundred feet. All seems peace beneath their leafy canopy. But nowhere on earth has a more bitter struggle been fought for years. Since the first thick crop of seedlings peeped above the ground, that forest has been a stricken field of death, and the tall boles that soon will minister to the arts of peace and war are the victors in a bitter, ceaseless strife which began with their life and will end only when the axe shall lay them low.

Now, this struggle between the trees for supremacy is the very circumstance of which the forester takes advantage to produce the straight-boled timber for which men are willing to pay him good money, and a plentiful supply of which is of such importance to the industries of the State. Where there is timber like that there is work, and I need not tell you that a man at work is the friend of the State.

Did you ever think for a moment how the trees of the forest are pruned?

You know that if you plant a tree out there in the lawn, and want it to make a straight stem, you must keep a sharp eye to it and rub off the small shoots as they grow, otherwise you would have a spreading tree with plenty of leaves and branches and no timber worth speaking of. And though some trees have a greater tendency to bole than others, this is pretty true of any tree. The forest trees prune each other. The side branches become aborted for want of light and air, and the crown fights its way upward to the light. As you walk through the forest you may see any number of these branches in process of suppression, particularly if it is a forest like our coast eucalyptus forests, where there are always many scores of little seedlings, the great majority of which will never come to anything, waiting with infinite and pathetic patience for any break in the canopy of foliage, a storm, the woodman's axe, the fall of a diseased limb, anything which will give them a chance for a rush for light and freedom, and when the opening does come, then comes the dash amongst the competing seedlings; one, a little stronger or better placed, forges ever so slightly ahead, the others remain stationary. The side branches quickly fall off the victor, and he takes his place amongst the rest, fighting for every inch of room, and ready the moment one of his neighbours yields an inch to spread out and, if possible, overtop him. Thus the fight goes on, and the forester looks and sees that it is good, for are not his trees pruning off their useless side branches and making him straight sticks.

Now, it will be patent to the merest novice that, given a forest like this, there are many ways in which the growth of the trees might be encouraged, such as thinning and the like, and as a matter of fact good labour has been wasted from time to time in more than one country because enthusiastic and well-meaning persons would insist on treating forests as if they were gardens, and endeavouring to reduce them to nice spick-and-span order, as if they existed for purposes of promenade instead of the prosaic one of producing marketable timber for their owner at a cost which would leave that owner a handsome profit on the transaction.

Our Australian forests are especially kind to the forester who knows how to take advantage of the kindness. Most forests possess, in a greater or less degree, the tendency to reproduce themselves naturally, without the aid of man; otherwise, except in the case of those artificially planted, they would not be there. In Europe this is a slow and unsatisfactory process, and although NATURAL REGENERATION, as this process of renewal is called, is often resorted to, artificial planting is regarded as most satisfactory, and is widely adopted. In India, on the other hand, natural regeneration is the mainstay of forestry. It is infinitely cheaper, and is found to serve best the purposes of the immense areas dealt with.

There comes a time, however, in the life of every forest when, subjected to unskilful management, it will reproduce itself no more. There are many treeless tracts in Australia where there were forests within the memory of many living, and which will not for centuries produce a tree unless it is artificially planted. But in the true forest, with the conditions of forest growth present, there are not, I believe, in the world more satisfactory conditions of natural regeneration than are to be found in vast areas of our forests.

Now, if the forester can arrange that the persons who want his timber shall take it in such order and regular rotation as to give his seedlings the chance they are so eager to avail themselves of; if he can arrange that, whilst they are pursuing their own trade of getting out the timber, they are also performing his work of giving the timber time to mature here, the young seedlings room to come up there, thinning out the sapling in another place, and clearing away the mature timber in another, it will be plain that he can get a good deal of his work done by others; but, if he has good timber to offer (and if this goes on for some time, he should have), he will actually be paid by the people who do his work. Now this sounds easy, but to hear the pavement generals who fought the recent campaign from their places on the sidewalks, it would seem that war is easy, the fact being that war, like forestry, is a difficult business. Your working plan is your plan of campaign, but the variations in detail are endless. Your working plan must be as perfect as your skill can make it, and then you must adhere to it like grim death, and work it for all it is worth.

(To be continued.)

CEDAR-PLANTING AT ATHERTON.

BY HOWARD NEWPORT, Manager, Kamerunga State Nursery.

Forestry operations need nothing said to justify them—they will justify themselves; and in this country, if they are what they purport to be, in whatever branch of the great subject, however small in themselves, it is not excuses for their being done that are required, but rather excuses for their not having been done years ago that are needed. As is aptly remarked by Mr. Mac Mahon in his writing on forestry: "The forester is but a gardener on a huge scale—his garden the State, his season a century." And, I repeat, the excuses required are not for doing something now, but for not having done it last season.

The object of this article is, however, not to advocate extensive operations in forestry, or discuss systems or methods of work, under this head (which should undoubtedly be a distinct branch of if not a separate and independently working department in itself) that may be applicable to and worthy of adoption in the State, but to give in detail, and from the point of view of a forest ranger, an account of the method of work, objects, and results of a very limited amount of reafforestation work that has been intrusted to my care.

Reafforestation work is not the *summum bonum* of forestry, as it is apt to be thought by many. It is not even a principal part of forest conservancy, although, under certain circumstances, it becomes advisable and necessary. It is but part of the whole, and should be but one move in the grand scheme of forest conservancy covering and embracing the whole of the forestry matters in the State. And in this connection it may be mentioned that the advantageous effect that such a prearranged system or general scheme would have had, both regarding the facility in working and reduction of expenses, even in this small work, was throughout abundantly evident.

The idea of collecting young red-cedar seedlings from where they were to be found in numbers and planting them in other parts of the forest reserves into areas where cedar had been, and where such were now no longer to be found, was first led up to by seeing the prolific manner in which cedar, under certain favourable conditions, germinated naturally in certain localities on the one

hand and the paucity of these trees in any shape or form in other spots whence it was known to have been obtained in quantity at one time, and where it might safely be concluded therefore it would grow again, on the other hand. And the subsequent action of the Forestry Branch of the Department of Lands last year, in actually setting in hand the work, was, I believe, largely due to the reports of Mr. F. W. Lade while forest ranger in the district.

It will be necessary, perhaps, so that the reasons for the operation may be understood, as well as interesting in itself, to mention the habits of growth of the trees we were to deal with. It is peculiar that in this respect I found timber-getters and others whose work kept them in the forests, while excellent judges of and authorities on timber, quite at a loss when it came to matters of habit, style of flower, season for seeding, and even identification of the seedlings themselves. The habits of all trees differ a great deal more than is generally thought. Cedar, apparently, once having attained a given size, and grown to the average height of the surrounding scrub so as to obtain its share of sunlight, blossoms and seeds annually. The blossom is insignificant, and the seed is produced in sprays or bunches of small pear-shaped pods about 1 inch in length and perhaps ¼-inch thick. These each contain a number of light winged seeds, which scatter with the bursting of the pod on attaining maturity, and float down to the ground often for some distance around the parent tree. The seed will lie dormant in the ground for a little time; how long it will do so and still retain its vitality is not yet determined, but from the very prolific germination around trees felled in seed, and the very much lesser quantity of seedlings found around trees felled at other seasons, it is evident its vitality is limited, and that, therefore, injudicious felling, even of matured timber, would very easily result in extinction of the species in any one locality. The seed will not germinate naturally in either excessive damp or in the absence of sunlight, such as you find in a forest of big trees, but when the parent tree dies or is felled, provided it has grown sufficiently to cause a gap in the leaf canopy of the forest and let in light and sunshine, seedlings at once spring up, often in great numbers, from which Nature herself chooses the straightest, sturdiest, and fittest with which to replace the parent, and to which the weaker eventually must give place. A little glimpse is here afforded us of Nature's own methods of forest conservancy—how, on the removal of trees that have attained maturity, she arranges for the due reafforestation of the area. It is on such natural laws that the forester bases his system of selection of trees for the axe. The violation of these laws is, it is to be said with regret, on every hand abundantly evident, for where localities are noticeably and remarkably deficient of cedar, it points incontrovertably to a wholesale removal of trees in an unnatural manner, and probably, therefore, of trees in themselves immature.

The work having been decided upon, an expenditure of £20 was sanctioned to begin with.

The nature of the work being new, and the necessity for keeping down the expenditure so urgent, only one hand could be engaged. To obtain a reliable as well as a competent man, who would be able to carry out instructions, and continue doing so without close supervision, which was not possible, was no easy matter; but in Mr. W. Stovell the man for the work was found, and he has done excellent work under somewhat trying circumstances, both last season and again this season. Last season was, as will be remembered, a very wet one. Creeks were in flood during almost the whole of the time the work was in progress; the man in charge, to whom great credit is due for an unflagging interest in his work, having to wade breast-deep to work on many occasions, and remain wet through all day, and on more than one occasion having to swim the creek on returning from work in the evening. During such weather the atmosphere of the scrubs, where no sunlight penetrates, is anything but pleasant, not to mention the inconvenience afforded by mosquitoes, leeches, flies, &c., and the overpowering smell of the rotting vegetation.

The spot chosen to be planted up was the reserve at Carrington, on the Barron River, about 5 miles from Atherton. The necessary tools were pur-

chased, consisting of a mattock, a scrub-knife, a smaller knife for cutting plants, &c., a spade, and a half-axe. Of these tools, it was found that the spade was, on account of the stony nature of the land in most parts, of little use, having to give place to the mattock. The work was set in hand on the 9th of March, 1903. The plants to be put in were obtained from various spots, mostly from the borders of the road between Atherton and Martintown, now called Tolga, and the tracks leading from it—in such spots as have already been described, where the parent tree, having been felled when in seed and the ground opened up to the sunshine, quantities of healthy young seedlings had sprung up. The method of work adopted was to prepare the lines and holes for some 250 plants or so (which it was found was about the number possible to collect and plant in a week) during the early part of the week, collect plants for one day, and plant them out during the latter part of the week. The reserve chosen consisted of a block of land fairly low-lying and on the whole fairly level, well-suited for the growth of cedar, being protected on the south-eastern side by a hill and bounded on two other sides by Scrubby Creek, and on the fourth by the Barron River, and having a gentle slope towards the river.

This block had at one time a quantity of cedar growing upon it, cut, from the appearance of the butts, at least some ten years ago, and probably longer. A sawmill, which has since been removed to nearer Atherton, was at that time located conveniently near, and no doubt the timber suffered in consequence.

The lay of the land is such that but little snigging was done apparently, the timber-wagons being taken right to the felled logs. The reserve is intersected by a considerable number of tracks—a few main tracks and a network of feeders, radiating, divaricating, forking; meeting, separating, and joining again, in what seems now an aimless manner, but which until recently no doubt disclosed its objects by the presence every few yards almost of butts and tops of some timber tree. And, curiously enough, but few of these tracks proved a *cul-de-sac*, as one would naturally expect.

As is to be expected, these tracks are not only irregular, but are now to some extent overgrown. They are not yet obliterated—indeed, in really heavily timbered country a track once cut remains for many years. In some instances, the trend of these is more readily followed by looking upwards and following the gaps in the foliage overhead, which has not yet been utilised by the neighbouring trees, than by terrestrial indications; and in these cases the brushwood consists of stinging-tree and shrubs and bushes 10 to 20 feet high, with but an occasional sapling, which necessitated the cutting of a narrow track to work in. This, however, is exceptional, for the greater part the scrub is so dense that in clearing tracks sufficiently broad for the timber-wagons (when all the larger trees were avoided) no break in the leaf canopy overhead was made, and where this is so the tracks are still distinct and well-preserved. In many instances they are beautiful lanes and avenues, carpeted with mosses, ferns, and all kinds of shade-loving plants, as well as seedlings of the larger trees, their young leaves displaying delicate shades of every hue, veritable playgrounds of the forest sprites—Nature's own greenhouses, where every fallen limb and rotting stump is rendered picturesque and graceful; where every turn displays a new, and, if possible, prettier arrangement and combination of foliage to arrest attention. Here a festoon of flowering creeper, and anon a slender and almost invisible spray of lawyer-cane tendrils, sharing with the stinging-tree the duties of Nature's policeman in guarding these glades, and taking toll of, and often literally arresting, the trespasser, and bringing him back, uncomfortably suddenly, to the prosaic, and to the remembrance that even these seemingly solitary glades, where Nature displays her beauties so lavishly, are peopled by myriads of mosquitoes, leeches, &c., who, far from resenting the intrusion of your presence, take full advantage of the occasion, to the discomfort of the forester destined to spend day after day, through perhaps the wettest season of the year, turning up the dank and rotting leaves and mould in planting out the seedlings he has elsewhere collected.

From the number and nature of the tracks it may be deduced that either the amount of cedar removed was considerable or that other timbers must have been taken. Very few indications point to any quantity of other timbers, how-

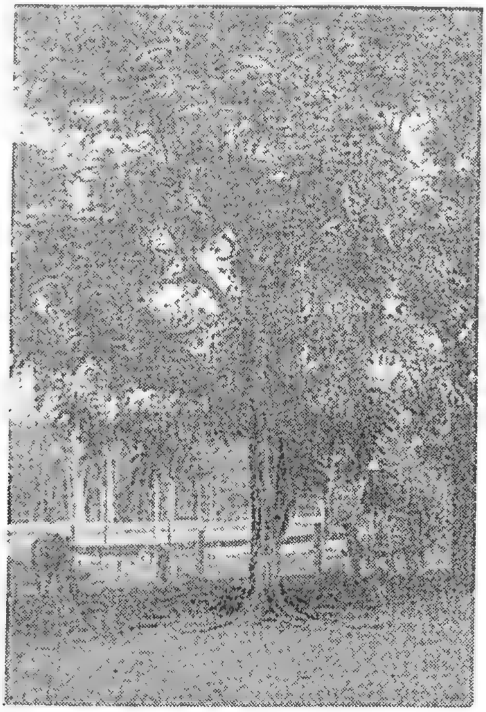


Fig. 1.

ever, except perhaps an occasional kauri pine, for very little hardwood exists thereabouts. It is very evident that the timber has not only been wastefully felled, as is evidenced by the presence of rotting and rotted butts and tops, but that the whole block has been milked dry of its valuable timbers, and also apparently gone over at different periods in a manner, from the forest officer's point of view, painful to see. With the exception of two small-sized trees, unaccountably passed over, no cedar has yet been met with in the whole of the 1,200 odd acres of this reserve that is more than 4 inches in diameter, and only very few of these. In order to make the first planting-out as cheap as possible, and more especially as it was to be considered in the nature of an experiment to ascertain to what extent young cedar plants could be successfully transplanted, advantage was taken of these existing tracks, and the plants put out along them on either side alternately every fourteen paces or so, or, as nearly as could be roughly calculated, 40 feet. Around each plant a small circular space about 6 feet in diameter was cleared, and for subsequent identification, and, if necessary, the planting up of failures, a blazed stake was put in alongside the plant. When new tracks were cut or old ones continued or joined, a space only wide enough to walk along was cleared through the undergrowth, and the plant put in the middle of such tracks, with similar spaces cleared round them. In effect, this resulted in some 10 to 12 plants being set to the acre. Had regular and parallel tracks been cut at 40 feet apart, some 27 trees would have been secured to the acre, but the work would have been, at any rate at first, obviously more expensive, the extra expense of cutting new tracks being not so much in the actual cutting, which was very little, but in taking the lines; great care having to be exercised and the lines carefully followed by means of a prismatic compass to keep them from running into each other and parallel.

The land is very stony, in parts so much so that it is difficult to find a spot with sufficient soil on it to put the young plants into. It is only a comparatively small area that is as stony as this, however, and where it is so the growing timber is sparse and scanty, too; but the whole area is too stony to be of use for agricultural purposes. Of the whole block, barely 100 acres could in any way be classed as suitable for cultivation. The soil is a red volcanic loam, and is eminently suitable for just such an experiment as that in hand.

From the peculiarity of young cedars springing up on a clearing being made, the suggestion was made by some local residents that the quickest way to reproduce cedar would be to simply fall the scrub. This is, of course, absurd, and would be quite contrary to all laws of forestry work, for many and sound reasons. To mention a few only: The natural springing up of cedar seedlings is irregular, for reasons explained above; the expense of a general felling would be infinitely more costly than the present method; the waste of all other timbers would be wanton and unnecessary; and, principally, that the effect of growing trees thus practically in the open would be to have them branch too early and give knotted and short stems, the object of planting in the standing scrub being to draw the saplings up into straight poles, which, on attaining the average height of the surrounding trees, will then increase in girth, and give a clean, straight trunk, free from blemish, and allowing of less waste in subsequent cutting up. In this connection the two illustrations, Figs. 1 and 2, may be noticed. Fig. 1 illustrates a cedar-tree said to be now twenty-five years old, growing in the open not far from the reserve. The height is about 40 feet, and the girth 3 feet 6 inches, while the length of stem to the first branch (on the right) is only some 3 feet, and to the second branch (on the left) only about 15 feet. Fig. 2 is a cedar sapling discovered in the reserve, and estimated to be five years old. It is about the same height, with a girth of about 1 foot—*i.e.*, about 4 inches diameter

FIG. 2.

3 feet from the ground. A white handkerchief has been wound round it, in order that the size of the stem may be the more readily seen. The growth of cedar would probably be quicker in the open, but it will be seen from the illustrations that the amount of serviceable timber resulting eventually is not to be compared.

The work was closed down on the 9th of May, after exactly two calendar months, with a result of 1,415 plants put out and 121 cedar seedlings, averaging perhaps 1 inch through (and including about half a dozen saplings such as depicted in Figs. 2 and 3), which were cleared round, freed from overhanging creepers, &c., and staked for subsequent identification in the same manner as those planted. The total cost amounted to £25 3s. 6d., which gives a result of about 33s. per 100, or, say, 4d. each plant. The area treated is estimated at about 150 acres, which would give about 10 plants to the acre on the average.

The actual value of the work done is difficult to compute, as there is little to base any such calculation on at present. The trees now planted and established at a cost of about 4d. each should be worth, at lowest computation, £1

FIG. 3.

each in twenty-five years' time, and £2 10s. to £3 in fifty years. In other words, the £25 now spent should represent an asset of 200 times that amount well within the century.

The length of time for the maturing of reafforestation work need not necessarily be so great. With systematic work and attention the reserve would be revenue-producing long before the periods mentioned. In any case, the matter must not be looked at from the point of view of private investment, but from the wider standpoint of the credit of the State—the existence, stability, and prosperity of which do not depend upon, and are in no way commensurate with, the length of life of individuals of the population. A century to a nation is but a period of evolution—" to the forester [to quote again] but a season."

The immediate result of this work of last season has been the sanction of another small grant—this time £30—and instructions to plant some more. Accordingly the work has been set in hand, and is now in course of being carried out. Fortunately it was possible to again obtain the services of Mr. Stovell, with the result that the work was in full swing from the jump, and without any preliminary delays in teaching, explaining, selecting of localities, searching for spots whence seedlings might be advantageously and speedily collected, &c.

The four first days of the second season were spent in going over last season's planting. The trees were found in good order, and only in a very few instances required attention in the direction of clearing round them or of pruning when two or more heads had formed. Many of the plants had grown from 12 or 18 inches to a height of $4\frac{1}{2}$ to 5 feet, the average being about 3 feet 6 inches. Fig. 3 is an average specimen. Unfortunately, owing to the difficulty of "snapshotting" in the dense scrub, where the light is poor—and what there is, is from immediately overhead—the illustrations are not too clear. It will be seen, however, that the top of the young plant is on a level with the breast pocket of the figure behind it (Mr. Stovell), and the blazed stake alongside is also seen.

The failures were counted, and numbered 157 out of the 1,536 planted. These misses, which are mostly near the river on low-lying spots, are due mainly to excessive moisture, and were so scattered as to make their replacement too expensive to be worth while.

Owing to this season's work necessitating the cutting of new tracks to a great extent, the cost may prove to be a little higher, perhaps 5d. per plant instead of 4d., but against this the saving of time in commencing must be counted. The cost of the whole operation could be reduced and the work more satisfactorily done if a definite scheme were drawn out; the areas to be thus dealt with apportioned out, and at the close of one season's work the Forest Ranger allowed to make beds and set seed, in some suitable and adjacent locality, from which the seedlings could be readily and cheaply transplanted.

The use of bamboo pots in this connection would be worth consideration. A few clumps of bamboo of the common green variety exist in the district, which could probably be obtained at little cost, and would furnish some thousands of pots by being sawn into lengths. These could be set side by side in beds in some spot adjacent to or within the area to be next planted, filled with loam, and sown with seed, and be ready the next year for safe and speedy removal and planting out, with a practical certainty of success in every instance.

NEW AND SIMPLE CURE FOR SNAKE-BITE.

At a recent meeting of the Royal Society Sir Lauder Brunton, F.R.S., Sir Joseph Fayrer, and Dr. L. Rogers presented a handy portable lancet and a practical method of preventing death from snake-bite simpler of application than the anti-venin serums of Dr. Calmette or Dr. Fraser. A description and illustration of the lancet, in the handle of which are crystals of permanganate of potash, are given in *Nature*. On getting bitten, a bandage is to be tied above the bite to arrest the circulation, the bite is to be lanced into a wound, and the permanganate, moistened with saliva if necessary, rubbed into it. The permanganate is an antidote for all sorts of snake-bite.

[The above was forwarded to us by Mr. George Collier, of Gowrie. We are always pleased to receive any possible remedies for snake-bite, especially such as can be applied on the spot without a journey in search of a medical man. —Ed. *Q.A.J.*]

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1903.			1904.									
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.
North.													
Bowen	1·36	3·14	6·13	3·45	2·65	1·12	0·31	0·25	0·30	Nil	Nil	Nil	1·66
Cairns	0·91	3·10	13·51	10·03	10·55	15·73	13·33	3·21	Nil	0·35	0·62	0·12	0·37
Geraldton	3·05	7·13	37·86	24·37	14·04	31·09	38·73	11·81	0·39	1·78	3·99	0·76	2·49
Herberton	0·67	6·21	15·52	8·01	5·16	18·25	7·08	1·55	Nil	Nil	0·59	0·44	0·62
Hughenden	0·80	2·36	5·30	2·71	2·80	1·93	1·36	0·07	0·44	Nil	Nil	0·22	4·10
Kamerunga	1·39	4·94	14·33	7·37	9·39	22·35	15·48	3·50	Nil	0·42	1·05	0·27	1·00
Longreach	0·90	0·83	1·76	1·77	2·69	1·01	0·31	2·78	0·04	Nil	Nil	Nil	4·66
Lucinda	0·76	10·67	40·34	11·71	8·40	22·40	11·30	4·00	Nil	0·45	Nil	2·00	1·90
Mackay	1·54	9·86	5·52	16·74	3·17	5·69	5·24	3·61	0·93	0·12	0·04	8·14	8·07
Rockhampton	1·84	7·42	4·08	5·12	3·50	5·11	13·82	0·77	1·26	0·03	Nil	0·22	1·36
Townsville	2·42	5·97	19·02*	5·48	5·19	4·01	1·03	0·24	0·04	Nil	Nil	0·04	3·67
South.													
Barcaldine	1·01	4·00	0·92	3·26	0·96	0·11	1·19	3·85	0·16	Nil	Nil	0·20	3·88
Beenleigh	3·29	4·78	1·60	2·81	1·25	8·06	14·99	6·17	0·15	1·54	0·25	2·11	1·89
Biggenden	2·77	4·37	5·62	7·48	0·71	3·16	2·92	2·29	0·71	0·29	0·29	Nil	4·06
Blackall	0·45	2·56	1·79	2·28	3·67	0·39	3·76	3·08	0·32	0·12	0·14	Nil	4·99
Brisbane	3·65	3·98	2·19	2·65	0·77	7·07	7·23	4·04	0·59	1·48	0·53	1·59	1·28
Bundaberg	0·43	3·25	9·97	3·18	0·85	4·26	5·64	1·32	0·86	0·51	0·62	0·48	3·32
Caboolture	3·11	9·98	4·18	4·29	1·32	8·48	9·90	4·66	0·17	2·12	0·30	1·53	2·42
Charleville	0·95	2·20	2·98	1·87	2·56	4·60	3·62	3·07	0·31	0·52	0·15	0·40	3·14
Dalby	3·12	6·30	1·19	1·88	3·20	4·74	0·40	4·69	0·34	2·63	0·24	3·01	1·7
Emerald	1·90	2·21	4·30	2·70	1·26	4·14	5·88	1·23	0·96	0·06	0·09	0·06	1·44
Esk	3·69	4·02	1·43	2·37	1·86	3·18	4·91	3·99	0·20	2·43	0·33	3·10	2·90
Gatton College ...	4·71	5·05	1·04	2·15	1·20	4·17	2·59	3·79	0·45	2·12	0·07	1·09	1·95
Gayndah	4·37	3·03	5·12	7·01	1·83	2·97	1·63	1·61	0·93	0·99	0·41	0·27	2·49
Gindie	1·97	4·06	4·26	1·52	1·40	1·83	4·81	1·65	0·43	Nil	0·21	0·02	3·09
Goondiwindi	2·16	3·73	3·62	2·90	2·65	7·32	0·37	3·40	0·49	2·62	0·67	1·64	1·09
Gympie	5·61	4·50	4·88	9·27	1·80	3·32	10·86	4·11	0·60	1·11	0·47	0·84	4·08
Ipswich	2·98	3·84	1·01	4·07	1·72	3·55	4·71	3·50	0·23	1·75	0·05	1·56	3·20
Laidley	5·47	3·87	1·82	2·93	1·35	5·36	2·83	3·12	0·32	1·68	Nil	1·87	1·87
Maryborough	2·62	3·96	5·04	2·64	0·56	3·94	10·07	4·12	1·37	0·39	0·46	0·62	3·52
Nambour	3·85	6·13	2·43	6·39	1·91	10·30	15·43	6·94	0·32	1·78	0·59	0·43	1·62
Nerang	3·52	3·86	4·24	3·89	0·85	11·18	13·83	7·52	0·19	1·12	1·22	2·21	3·52
Roma	1·92	3·16	4·21	1·85	0·59	2·32	5·06	3·73	0·20	0·84	0·70	1·22	1·43
Stanthorpe	3·45	4·45	2·59	2·29	1·33	6·57	0·71	4·11	0·66	2·64	0·34	1·85	3·98
Tambo	1·08	3·17	2·91	2·48	1·72	1·26	5·46	3·96	0·28	0·61	0·22	Nil	3·31
Taroom	2·05	3·76	3·22	1·39	2·79	1·58	2·21	3·49	0·54	0·59	0·82	0·05	2·42
Tewantin	2·85	9·85	1·37	3·03	2·59	19·55	30·39	9·20	0·21	1·11	2·20	0·50	1·09
Texas	2·47	4·93	4·44	1·70	3·67	5·72	0·03	2·99	0·70	2·12	0·48	0·81	1·63
Toowoomba	3·82	4·85	4·27	4·26	3·98	4·76	3·29	4·08	0·38	2·58	0·02	2·24	1·61
Warwick	2·89	3·92	2·73	0·60	2·91	5·74	0·66	2·85	0·53	1·98	0·19	2·76	2·89
Westbrook	4·03	5·11	3·75	1·46	2·82	3·49	9·00	3·18	0·22	2·24	0·14	2·29	4·85

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Danish, 114s.; Victorian, 100s. to 102s.; New South Wales, 98s. to 100s.; Queensland, 88s. to 92s.; South Australian, 92s. to 96s.; New Zealand, 92s.

CHEESE.—Canadian, 37s. to 40s.; New Zealand, 35s. to 40s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £18 to £19 6s.; raw, £15 to £17 6s. per ton; German beet, 88 per cent., 12s. 7d.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—4s. to 8s. 6d. per cwt.

RICE.—Rangoon, £8 10s. to £13; Japan, £13 to £18; Java, £19 to £21; Patna, £17 to £19 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 41s. to 105s.; peaberry, 60s. to 120s.; Santos, 31s. to 51s.; Mocha, 56s. to 92s.; Jamaica, 100s. to 125s. per cwt.

CHICORY ROOT (duty paid).—24s. to 25s. per cwt.

ARROWROOT.—St. Vincent, 1⅝d. to 3½d.; Natal, 5¾d. to 7d.; Bermuda, 1s. 2d. to 1s. 5d. per lb.

WHEAT.—Duluth, 35s. to 36s. per 496 lb.; English, 29s. to 32s. per 504 lb.; Australian, 33s. 9d. to 32s. per 480 lb. = 3s. 11½d. to 4s. per bushel.

FLOUR.—26s. per 280 lb.

MALTING BARLEY.—30s. to 32s. per 448 lb.; grinding, 36s. to 40s. per 416 lb.

OATS.—New Zealand, 22s. to 24s.; Algerian, 14s. 6d. per 384 lb.

SPLIT PEAS.—38s. to 38s. 6d. per 504 lb.

GINGER.—Jamaica, 50s. to 60s.; Cochin, 42s. to 55s.; Japan, 16s. to 17s. per cwt.

VANILLA.—3s. to 7s. per lb.

PEPPER.—Capsicums, 14s. to 60s.; chillies, 45s. to 50s. per cwt.; black, 4⅞d. to 5¼d.; white, 7¼d. to 7½d. per lb.

GREEN FRUIT.—Apples: Lisbon, 6s. to 8s. per case; bananas, 6s. to 10s. 6d. per bunch; pineapples, 2s. 9d. to 5s. 6d. each; oranges, Italian, 5s. to 8s. per 160; lemons, Messina, per 360, ordinary to fine, 7s. to 9s.

DATES.—Tafilat, none; Egyptian, none; Persian, 6s. 3d. to 10s. per case.

COTTON.—Uplands, 5½d. to 8d.; Sea Island, 1s. 2d. to 1s. 6d. per lb.

COTTON SEED.—£5 10s. to £7 per ton.

COTTON-SEED OIL.—Crude, £17; refined, £18 to £19 10s. per ton.

COTTON-SEED OIL CAKE.—£4 11s. 3d. to £4 13s. 9d. per ton.

COTTON WASTE.—In 5-cwt. bags, 24s. to 34s.; discoloured, 18s. to 25s. per cwt.

LINSEED.—36s. per 416 lb.

LINSEED OIL.—£17 to £17 15s. per ton.

LINSEED OIL CAKE.—£7 7s. 6d. to £7 12s. 6d. per ton.

OLIVE OIL.—£30 to £55 per tun (252 gallons).

COPRA (cocoanut-kernel).—£16 15s. to £17 10s. per ton; £8 to £9 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£28 to £33 per ton.

BEESWAX.—Australian, £7 2s. 6d. to £7 5s. per cwt.

LUCERNE SEED.—60s. to 75s. per cwt.

CANARY SEED.—72s. to 95s. per quarter of 480 lb. = 8s. 9d. to 11s. 10½d. per bushel.

MANILLA HEMP.—£30 to £35 per ton.

SISAL HEMP.—£35 to £39 2s. 6d. per ton.

NEW ZEALAND HEMP.—£28 15s. per ton.

FLAX.—£48 to £52 per ton.

TAPIOCA (duty, 5d. per cwt.).—1d. to 2d. per lb.; pearl, 10s. to 13s. per cwt.

EGGS.—French, 11s. to 11s. 6d.; Danish, 8s. to 10s. 7d. per 120.

BACON.—Irish, 48s. to 61s.; American, 42s. to 48s.; Canadian, 46s. to 50s. per cwt.

HAMS.—Irish, 76s. to 92s.; American, 35s. to 36s. per cwt.

TALLOW.—Mutton, fine, 27s. to 28s.; medium, 25s. to 25s. 9d; beef, fine, 25s. to 25s. 6d.; medium, 24s. to 25s.

Goatskins.—Cape, from extra light to heavy, 9d. to $13\frac{1}{2}$d.; Angora, light to heavy, 5d. to $7\frac{1}{2}$d.; Natal, goat and Angora, $1\frac{3}{4}$d. to 8d. per lb.

Poultry (Smithfield).—Large supplies; slow demand. Quotations:—Fowls: Yorkshire, 2s. 6d. to 3s.; Essex, 2s. 3d. to 2s. 9d.; Boston, 2s. to 2s. 6d.; Surrey, 3s. 3d. to 3s. 9d.; Sussex, 3s. to 3s. 3d.; Welsh, 1s. 9d. to 2s. 3d.; Irish, 1s. 6d. to 2s.; goslings, 4s. 6d. to 6s.; Aylesbury ducklings, 3s. to 4s.; country, 2s. 3d. to 2s. 9d. each; Australian wild rabbits, 6s. 6d. to 8s. 9d. per dozen.

Frozen Meat.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Nov. 12.	Nov. 19.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{3}{8}$d.	$4\frac{3}{4}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{4}$d.	$4\frac{3}{4}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{8}$d.	$4\frac{3}{8}$d.
Dunedin and Southland (56 lb. to 64 lb.)	$4\frac{1}{4}$d.	None offering.
North Island (56 lb. to 65 lb.), ordinary	$4\frac{1}{8}$d.	$4\frac{3}{8}$d.
North Island, best	$4\frac{1}{4}$d.	$4\frac{5}{8}$d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{7}{16}$d.	$3\frac{5}{8}$d.
Light (under 50 lb.)	None offering.	
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{3}{8}$d.	$3\frac{1}{2}$d.
Light (under 50 lb.)	$3\frac{9}{16}$d.	$3\frac{3}{4}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{3}{4}$d.	$6\frac{1}{4}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$5\frac{3}{4}$d.	$6\frac{1}{8}$d.
Dunedin and Southland (28 lb. to 42 lb.)	None offering.	
North Island (28 lb. to 42 lb.) ...	None offering.	
Australian Lambs.		
30 lb. to 40 lb.	$5\frac{1}{4}$d.	$5\frac{1}{2}$d.
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{3}{16}$d.	$2\frac{1}{4}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$2\frac{5}{8}$d.	$2\frac{5}{8}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	$2\frac{1}{16}$d.	$2\frac{1}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{8}$d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{1}{16}$d.	$2\frac{1}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{8}$d.

Queensland Timber.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the home market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand.

General Notes.

THE WONDERFUL EUCALYPTUS.

In the interesting report we publish in this issue by Mr. H. Newport on the planting of young cedar-trees in the Atherton scrubs, it will be observed that trees now valued at 4d. will, in twenty-five years, be worth £1 each. According to one of the American newspapers, however, we possess a tree in Queensland, and not only in Queensland but in all the States of the Commonwealth, which puts in the shade any cedars or pines in our scrubs, as far as rapidity of growth and size are concerned. This is the Eucalyptus—which kind is not stated. We are told that, of all forest trees, it is the most useful to mankind. In our young days we learnt that this usefulness was confined to the coconut palm, but we live and learn. To-day the Eucalyptus has its turn. The United States Bureau of Forestry issued a bulletin on this order of trees, and some writer has taken this as the basis of an ironical article in the journal in question. The writer predicts that the different varieties of eucalypts will solve the fuel problem both in America and Europe. These trees have no equal in rapidity of growth: five years from the time of planting groves raised from seedlings will yield seventy-five cords of stove wood per acre! Reader, do you know what a cord of wood is? It is a pile 8 feet long, 4 feet wide, and 4 feet high, containing 128 cubic feet of timber. Seventy-five of these cords represent 9,600 cubic feet, worth, at 12s. per cord, £45. Then, when the seventy-five cords of timber have been cut, lo! in three years' time the sprouts that spring from the stumps mature into big trees, and produce more cords to the acre than the original trees!

Repeated cuttings only add to the thriftiness of the eucalypt. The sugar-cane, asparagus, and lucerne do not seem to be in it compared with the succulent gum-tree! A 25-year-old gum-tree is said to equal in size a 300-year-old oak. Then we are told that some eucalypts thrive in swamps, others in the mountain snows far above the timber line. If they flourish far above the timber line, what use is there in having a timber line at all? Then, again, we learn that it is delighted with arid plains, where not even a cactus will live. What a grand tree for the Suez Canal banks, the Sahara, and the Soudan! The tree is extensively used in Australia for shipbuilding. Lastly, as to the size of these trees. It appears that they run from 30 feet in diameter at the base to 12 feet at the top of a 100-foot log. These are a few of the statements which are considered to be absurd by the journal in question, and are placed on a par with another old newspaper story to the effect that the cork forests of Spain extend over 620,000 square miles. As a matter of fact, the peninsula of Spain does not cover more than a couple of hundred square miles, so that either these cork forests must be growing over many square miles of the Mediterranean and Atlantic, or they must be piled like the old coal forests, one on top of the other. Now what are the actual facts?

The actual facts concerning our eucalyptus-trees are, that certain varieties will, in five years, produce more than 100 cords of stove wood. A young plantation of red gums or tallow-wood trees will contain 3,000 to 4,000 saplings, which, at their first thinning, will yield an immense number of scaffold poles, followed by hundreds of mining props, to be succeeded by piles, all more valuable by far than cord wood for stoves. As to the height and diameter of the trees, there is no exaggeration in the statement that trees are obtained of enormous size, too large to be cut down in the ordinary way with saw or axe. The coppice growing after the trees have been cut down will, for a couple of cuttings at intervals, supply immense quantities of useful timber. The United States Bureau of Forestry has not in any way exaggerated the value of the Australian eucalypts.

Answers to Correspondents.

SICK TURKEYS.

A correspondent writes:—I have had a hundred young turkeys for about three months, and sixty of them have died or are at present sick. I feed them on boiled sweet potatoes, cracked corn, bran, bread, and pollard. They all get a sort of dysentery, and all they pass through them is yellow. They lose their appetites, and linger for a week or more before they die. I have given them salad oil, castor oil, and kerosene, but it did them no good. The birds have a good run and plenty of grass. Can you supply me with a remedy?

We referred the matter to Mr. Hindes, Poultry Expert at the Agricultural College, Gatton, and he replied as follows:—

This is not an infectious disease, but simply the effect of a cause, and the latter must be removed. The following are some of the causes:—Indigestible food, over-feeding, the presence of acrid matters, irritating or decayed vegetables, unslaked lime, or poisonous weeds. There is an iris growing in this district that causes the trouble; it springs up after light rains, before the grass does, and fowls eat it freely; it is like fine grass when it first comes up, and it afterwards gets brownish, and bears red berries. The feeding mentioned appears poor in quality for young turkeys. Discontinue the bread and give rolled oats instead, with some lean meat; also add panicum seed and wheat for variety. Young turkeys feather very quickly, and need plenty of nitrogenous food. For the sick birds, feed on boiled rice or pearl barley for a few days. Never give castor oil; a little salad oil would do good, as it is the mucous membrane that is affected, and soothing nourishment is needed. Give plenty of barley water to drink, and to the sick poults four drops of chlorodyne twice a day. Put them in a comfortable house on a soft bed when convalescent. A little sulphate of iron might be put in the drinking water, sufficient to give it a slightly bitter taste.

REMEDY FOR BLIND TEAT.

C. C. Ridley, Lakeside, writes:—

I became possessed of a cow which, through some unknown cause, had a blind teat. The animal has had three calves, the last one a few days ago. On these occasions, the "blind" quarter always swells; the last time the swelling affected all one side of the udder, causing both teats to be dry or practically so. Twelve months ago I rubbed castor oil into the swelled part, and although I succeeded in procuring some liquid—it could not be called milk—after a very short time the quarter completely dried up again. As the cow is a profitable milker, I am anxious to prevent the evil spreading. Can you prescribe a treatment for this case?

Answer.—The case has been submitted to Mr. A. H. Cory, Government Veterinary Officer, who states:—

There is evidently an obstruction in the teat canal, which might be removed by inserting a teat syphon night and morning. The syphon must always be placed in boiling water for a few minutes to thoroughly cleanse it before using. The swelling referred to in the blind quarter is probably the natural gland secretion, but, unless relieved, there is a great risk of the gland substance undergoing certain changes due to inflammation. These cases are always troublesome to treat, but I would recommend the *careful insertion* of a milk syphon and hot fomentations twice daily for an hour or more. Then rub in some turpentine liniment. At each time of milking, try to get milk from the affected quarter. This is very important.

WORMS IN PIGS, Etc.

Fredk. Pool, Oak-tree Farm, Milora.—

1. Your article on "Ensilage" too late for insertion in this issue. It will be published in the next number of the *Journal.*

2. In the December issue of the *Journal* for 1900, we gave the following five recipes for the trouble:—1. Santonin, a quarter teaspoonful at a dose. Dissolve in hot water or alcohol, and mix with a little gruel or milk. 2. Fluid extract of spigella and senna, equal parts, given in ½-oz. doses every 4 hours until it causes purging. 3. Turpentine in milk, or in a small portion of good slop, from 15 to 20 drops three times a day. 4. Coal oil in slops has been found effective. 5. Tobacco boiled down to a small decoction in water, given in teaspoonful doses three days in succession, in some slop in the morning. Recipes 1, 2, and 3 should be followed by a physic of salts or oil. All these doses are for full-grown pigs. Reduce them for younger pigs.

3. In-and-in breeding should be avoided.

Times of Sunrise and Sunset, 1904.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·3	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·1	5·34	5·28	5·47	4·58	6·6	4·46	6·29
3	6·0	5·35	5·27	5·48	4·57	6·7	4·46	6·30
4	5·59	5·35	5·26	5·48	4·56	6·8	4·46	6·30
5	5·58	5·36	5·25	5·49	4·55	6·9	4·46	6·31
6	5·57	5·36	5·23	5·50	4·55	6·9	4·47	6·32
7	5·56	5·36	5·22	5·50	4·54	6·10	4·47	6·32
8	5·55	5·37	5·21	5·51	4·54	6·10	4·47	6·33
9	5·54	5·37	5·20	5 51	4·53	6·11	4·47	6·34
10	5·53	5·38	5·19	5·52	4·53	6·11	4·47	6·35
11	5·51	5·38	5·18	5·52	4·52	6·12	4·47	6·35
12	5·50	5·39	5·17	5·53	4·51	6·12	4·48	6·36
13	5·49	5·39	5·16	5·54	4·51	6·13	4·48	6·36
14	5·48	5·40	5·15	5·54	4·50	6·14	4·49	6·37
15	5·47	5·40	5·14	5·55	4·50	6·15	4·49	6·37
16	5·46	5·41	5·13	5·55	4·50	6·16	4·50	6·38
17	5·45	5·41	5·12	5·56	4·49	6·17	4·50	6·39
18	5·44	5·41	5·10	5·56	4·49	6·17	4·50	6·39
19	5·42	5·42	5·9	5·57	4·49	6·18	4·50	6·40
20	5·41	5·42	5·8	5·58	4·48	6·19	4·51	6·41
21	5·40	5·43	5·7	5·58	4·48	6·20	4·51	6·41
22	5·39	5·44	5·6	5·59	4·47	6·21	4·52	6·42
23	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
24	5·37	5·44	5·5	6·0	4·47	6·22	4·53	6·43
25	5·36	5·44	5·4	6·1	4·47	6·23	4·53	6·43
26	5·35	5·44	5·3	6·1	4·47	6·24	4·54	6·44
27	5·33	5·45	5·2	6·2	4·46	6·25	4·54	6·44
28	5·32	5·45	5·2	6·2	4·46	6·26	4·55	6·44
29	5·31	5·46	5·1	6·3	4·46	6·26	4·55	6·45
30	5·30	5·47	5·0	6·3	4·46	6·27	4·56	6·45
31	...	...	5·0	6·4	...	...	4·57	6·45

Phases of the Moon.

			H. M.
3 Sept.	☽	Last Quarter	9 58 p.m.
10 ,,	●	New Moon	6 42 a.m.
17 ,,	☾	First Quarter	1 12 ,,
25 ,,	○	Full Moon	3 49 ,,
2 Oct.	☽	Last Quarter	11 52 p.m.
9 ,,	●	New Moon	3 24 ,,
16 ,,	☾	First Quarter	3 54 ,,
24 ,,	○	Full Moon	8 55 ,,
1 Nov.	☽	Last Quarter	9 13 a.m.
8 ,,	●	New Moon	1 36 ,,
15 ,,	☾	First Quarter	10 35 ,,
23 ,,	○	Full Moon	1 11 p.m.
30 ,,	☽	Last Quarter	5 38 ,,
7 Dec.	●	New Moon	1 46 p.m.
15 ,,	☾	First Quarter	8 6 a.m.
23 ,,	○	Full Moon	4 1 ,,
30 ,,	☽	Last Quarter	1 46 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1904.	Rockhampton. Rise.	Set.	Townsville. Rise.	Set.	Cooktown. Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m.	28 m.	26 m.	32 m.	30 m.
October ...	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m.	40 m.	14 m.	50 m.	12 m.
December ...	8 m.	2 m.	44 m.	10 m.	55 m.	7 m.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	NOVEMBER. Prices.
Apples, Eating, per packer	...
Apples, Canadian	18s.
Apples, Tasmanian, per case	10s. to 15s.
Apples, American, Eating	...
Apples, American, Green	...
Apricots, half-gincase	8s. 6d.
Apricots, American, per 108's	...
Bananas, per dozen	2d.
Bananas, per bunch	1s. to 1s. 3d.
Cape Gooseberries, quart	...
Cherries, quarter-case	10s. to 12s.
Custard Apples, quarter-case	...
Granadillas, case	...
Gooseberries, English	...
Lemons, Italian, per 360	...
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Lemons, per case	3s. to 4s.
Loquats, half-gincase	...
Mandarins, Local, per case	...
Mandarins, Bowen	...
Mangoes, per case	5s. to 6s.
Melons	...
Nectarines, half-gincase	...
Oranges, Italian, per 180	...
Oranges, per case	8s. to 10s.
Oranges, Sydney (packers)	...
Passion Fruit, quarter-case	5s.
Papaw Apples, per case	4s., or 4s. per doz.
Peanuts, per lb.	...
Pears, American, per 72's	...
Pears, Tasmanian quarter-case	...
Peaches, quarter-case	1s. 6d. to 2s. 6d.
Pineapples, per dozen	4s. 6d. to 5s.
Pineapples (rough leaf), per dozen	...
Plums, American, per 108's	...
Plums, Sydney, per 108's	...
Rockmelons	...
Rosellas, per sugar-bag	...
Seville Oranges, apple-case	...
Tomatoes, quarter-case	3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR NOVEMBER.

Article.		NOVEMBER. Prices.
Bacon (Pineapple)	lb.	5½d. to 7½d.
Barley, Malting	bush.	...
Bran	ton	£2 10s. to £2 12s. 6d.
Butter, Factory	lb.	8½d. to 9d.
Chaff, Mixed	ton	£2 10s. to £3

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR NOVEMBER—*continued.*

Article.		NOVEMBER. Prices.
Chaff, Oaten	ton	£2 10s. to £3 15s.
Chaff, Lucerne	,,	£2 10s. to £3
Chaff, Wheaten	,,	£2
Cheese	lb.	5½d. to 6d.
Flour	ton	£9
Hay, Oaten	,,	£4 10s. to £4 15s.
Hay, Lucerne	,,	£1 10s. to £3
Honey	lb.	1¼d. to 1½d.
Maize	bush.	2s. 3d. to 2s. 6d.
Oats	,,	2s. to 3s. 8d.
Pollard	ton	£3 to £3 15s.
Potatoes	,,	£3 to £4
Potatoes, Sweet	,,	...
Pumpkins	,,	15s. to £1 16s. 8d.
Wheat, Milling	bush.	2s. 5d. to 3s. 6d.
Wheat, Chick	,,	2s. 3d. to 3s.
Onions	ton	£6 to £7 10s.
Hams	lb.	8½d. to 9½d.
Eggs	doz.	4d. to 7¾d.
Fowls	pair	2s. to 3s. 8d.
Geese	,,	5s. to 7s. 6d.
Ducks, English	,,	2s. 6d. to 3s. 6d.
Ducks, Muscovy	,,	3s. 5d. to 4s. 6d.
Turkeys, Hens	,,	5s. to 7s. 9d.
Turkeys, Gobblers	,,	5s. to 17s. 6d.

ENOGGERA SALES.

Animal.	OCTOBER. Prices.
Bullocks	£8 7s. 6d. to £11 10s.
Cows	£5 12s. 6d. to £7 7s. 6d.
Wethers, Merino	22s.
,, ,, (shorn)	15s. 6d.
Wethers, C.B.	22s. 3d.
,, ,, (shorn)	15s. 3d.
Ewes, Merino	15s.
Lambs	12s. 6d. to 17s. 3d.
Pigs (Porkers)	30s. 6d.
Pigs (Slips)	7s. 9d.

Animal.	NOVEMBER. Prices.
Bullocks	£8 17s. 6d. to £10 2s. 6d.
Cows	£5 15s. to £7 17s. 6d.
Wethers, Merino	21s. 9d.
,, ,, (shorn)	15s.
Wethers, C.B.	21s.
,, ,, (shorn)	14s. 6d.
Ewes, Merino (shorn)	7s. 6d. to 10s.
Lambs	14s. 6d. to 18s. 3d.
Pigs	28s.

Orchard Notes for December.

By ALBERT H. BENSON.

In the Orchard Notes for November, I called special attention to the importance of marketing fruit properly, emphasising the necessity for careful handling, even grading, and attractive packing if satisfactory prices are to be obtained. Those remarks apply equally to the present month, or, in fact, to any month of the year, as there is always more or less fruit of one variety or another to be marketed; and it is simply wasting time and money cultivating, pruning, manuring, or spraying an orchard—in fact, doing everything possible to produce good fruit—if when the fruit is grown it is not put to the market in such a manner that it will realise the highest price. Careful handling, grading, packing, and marketing will secure a ready sale for good fruit in any market, even when the same fruit badly handled and unattractively got up would be unsaleable. Growers would do well to take a lesson in packing from the Californians who have been shipping apples, or from the Italians who are shipping lemons, to this State, as those fruits, even after a long and trying voyage and one or more transhipments, reach here in better condition and in a much more attractive state than our local fruit, which is often only carted a few miles.

Keep down pests wherever met with; gather and destroy all fly-infested fruit. Destroy orange bugs before they become mature by hand-picking or by driving them to the trunks of the trees, by tapping the other branches with light poles, the insects being brushed off from the trunks and main branches on to a sheet placed under the tree to catch them, from which they can be easily gathered and burnt.

All caterpillars, cut-worms, beetles, grasshoppers, crickets, or other insects destroying the foliage should be destroyed by either spraying the same with Paris green, 1 oz. to 10 gallons of water, or by dusting them with a mixture of Paris green and air-slacked lime, 1 oz. of Paris green to 5 lb. of lime. Keep the orchard well cultivated, especially in the dry districts; and where there is water available for irrigation, in such districts all citrus trees should receive a watering during the month unless there is a good fall of rain, when it will be of course unnecessary.

Pineapples, bananas, and other tropical fruit can be planted during the month, showery weather and dull days being chosen. The rainy season is the best time to transplant most tropical plants. Where it is desirable to go in for green-crop manuring, or for raising the green crop for mulching, cowpeas can be sown, as they will be found to make a very rapid growth now, which will be strong enough to keep most weeds in check.

See that all surface and cut-off drains are in good working order, and not choked up with grass, weeds, &c., as heavy rain may fall during the month, and there should be a get-away for all surplus water, which would tend to either wash the soil or sour it; stagnant water round the roots of the trees being exceedingly injurious at any time, and especially so during the heat of summer.

Farm and Garden Notes for December.

Field.—The grain harvest will now be nearing completion, and it is to be hoped that the magnificent yield that has been predicted will be fully realised. No heavy rains, such as were experienced last year in some parts of the grain-producing districts, have occurred to diminish the expected return. The estimates of the crop have been almost unanimous, and have run from

2,500,000 bushels up to 3,000,000 bushels, and if the estimated yield of from 17 to 19 bushels per acre be realised Queensland will have no cause to regret the efforts that were taken to renew the cultivation of grain-producing crops, after the effects of the drought of two years ago.

Given favourable weather, maize, panicum, imphee, Kafir corn, and sorghum may be sown, and arrowroot, ginger, and sweet potatoes planted.

KITCHEN GARDEN.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may still be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Take up onions, and spread them out thinly on the barn floor until the tops wither sufficiently to pull off easily. They should then be graded into sizes, and sent to market or stored in a cool dry place. Where there is an unlimited supply of water and shade can be provided, lettuce and other salad plants may still be sown.

FLOWER GARDEN.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface, beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. They may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant out at once in their new positions. Top dress all lawns.

Farm and Garden Notes for January.

FIELD.—The main business of the field will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpea. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and may be looked upon merely as an experiment. Plant potatoes whole.

KITCHEN GARDEN.—A first sowing of cabbage, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow, shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly, to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather sow French beans,

cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow, well-drained boxes or small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter, however, are unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying, garlic, onions, and eschalots as the tops die down.

Flower Garden.—To make the flower beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotted leaves. Fill the boxes with the compost, then sow thinly the seeds of annuals. Keep the surface of the soil moist, and, when the young seedlings are large enough to handle, lift them gently one by one with a knife or zinc label—*never pull them up by hand*, as by so doing the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf-mould. Then keep a sharp lookout for slugs and caterpillars. Keep a supply of tobacco dust on hand. Scatter this in the path of the slug, and he will cease from troubling you.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Foxhunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed boxes, mulch, shade, water, and kerosene spray—all of which imply a certain amount of morning and evening work—the flower garden in autumn and winter will present a charming sight, and will afford light and profitable occupation for girls with spare time on their hands.

Publication Received.

"THE HAWAIIAN FORESTER."

We have received the first copies of the first volume of a most excellent monthly journal, *The Hawaiian Forester and Agriculturist*, issued by the Board of Commissioners of Agriculture and Forestry. It contains numerous very instructive articles on the various fibre-producing plants, articles on forestry, on preparing land for irrigation, on wattle-growing, banana cultivation, besides many other subjects which possess great interest for all who are engaged in tropical and semi-tropical agriculture. Such a publication is a most welcome addition to the list of official agricultural publications. The September number contains a most excellent article on sisal hemp cultivation, and this is made the more valuable as the actual figures are given showing all the details of expense and profit attaching to the plantation of the Hawaiian Sisal Company since its inception in 1898. We would advise all sisal planters in Queensland to obtain a copy of this number.

Notes on the Past Year.

Another year has passed over our heads. Have all its hopes been realised, and the doubts and fears with which it opened been dispelled? Taking a purely rural point of view, there is every reason for answering these questions in the affirmative. The results of the year's operations in connection with Queensland's greatest rural industries have greatly exceeded the most sanguine expectations. Rarely have better seasons been experienced almost throughout the State, and as success in rural life is almost entirely dependent upon weather conditions, if the latter are favourable, the results in the way of production cannot fail to be satisfactory to the producers.

Pastoralists have been exceptionally fortunate, not only in the abundance of grass and water, but in the phenomenal increase in sheep. Many sheep-owners have doubled their flocks, taking two lambings in the year; or, at most, within fourteen months. In some cases the increase has reached 150 per cent. The shearing has been got through with very few of the hitches which have occurred in the past, and the May, November, and December wool sales have been very successful, high prices having ruled throughout, both for greasy and scoured wool. Authorities on the sheep industry of the Western country look forward confidently to an increase during the present year which will bring the numbers up to 15,000,000. Others believe that within five years the tally will reach 30,000,000. As the tendency now is in the direction of smaller flocks, and, furthermore, as there is a decided move in the direction of sheep-breeding on agricultural farms, there is reason to believe that, in the event of a future drought, the losses in sheep will be greatly minimised, because provision can be made for feeding a large proportion of them by cultivation combined with irrigation. However that may be, the present outlook for the sheep and wool grower is very hopeful indeed.

As with sheep so has the year been propitious to cattle owners, although in this case a far longer time must elapse before the numbers of horned stock can equal those of 1894, when over 7,000,000 were in the State. Cattle do not commence breeding until of a riper age than sheep, neither are they so prolific. It, therefore, necessarily follows that their numbers will increase at a much slower rate than those of sheep. Still, it is quite certain that the returns of cattle, which were being collected last month, will show a substantial improvement in numbers, as their progeny have been steadily increasing owing to the favourable seasons in most districts. A great number of stud cattle have been introduced from the adjoining States and from Great Britain, and it is confidently expected that improvement will be displayed in class as well as in numbers.

The recovery in all classes of stock will have a reviving effect on the various meat-exporting establishments. Indeed, already several works which were idle during the drought have recommenced operations, although stock are still too scarce to enable them to work up to their full capacity. Whilst severe losses were being sustained in the Southern, Central, and Western districts, it was supposed that the stockowners of the Gulf country would suffer in like manner. It, therefore, came as a pleasant surprise to find, as soon as an abundance of feed and water opened the stock routes to the South, that there were large areas which had scarcely suffered at all, and tens of thousands of fat and store cattle came pouring South to restock the Southern runs.

A gentleman, writing from Burketown at the end of September, 1904, gives a few interesting particulars on this subject. He was for some time on Mr. W. F. Buchanan's station, Waive Hill, on the Victoria River, in the Northern Territory of South Australia. The first attempt to send away cattle from there to New South Wales was made whilst he was there in 1904. The attempt, he

said, was successful, as he travelled with the mob for three months to the Queensland border. There were on this station, when the drought broke up, from 75,000 to 80,000 head of cattle. The country is splendidly watered with permanent lagoons and springs, and water is obtained anywhere close to the surface. There is a very great growth of small, bitter melons everywhere, and a drought is unknown. This station, he concludes, is typical of many others in the Northern Territory and in the Gulf country of Queensland.

There are thus probably far more cattle in the State than is shown by the official returns.

Horses appear to have held their own in spite of adverse circumstances. In 1903 their numbers in the Southern division, where 184,032 head are depastured within 150 miles of the coast, increased by 2,917. The Central division, with 79,733 head, shows a decrease of 47; whilst in the Northern division, with 138,219, the decrease only amounts to 8. There is a very good demand for Queensland horses for India and other Eastern countries, and the great horse sales at Longreach, Toowoomba, and other centres are numerously attended, and high prices are the rule.

Turning to another of our important industries—dairy farming—a very encouraging year has been experienced. The herds, which were decimated in 1902, have been, for the most part, rapidly built up again, by importation from the Southern States and from Great Britain, and also by natural increase. The quality of the dairy stock has been greatly improved, since the inferior cattle were unable to hold their own during the drought, and their places have been supplied by high-class animals. As a consequence, the average yield of milk has been far greater than before, the test higher, and the resulting commercial butter in larger quantities. New dairying country has been taken up; old cultivation areas have been converted into dairy farms. Butter factories, already numerous, are continually springing up in new localities, and the export of butter has already reached an average of 10,000 boxes every three weeks. (In December 15,000 boxes were exported, and in January 17,080 boxes.) What with the natural grasses and cultivated fodder crops, there is abundance of feed and consequently abundance of milk.

Conjointly with the dairying business, the breeding of pigs is making great advances. None but the best are now found on dairy farms, and they meet with ready sale to the agents of the bacon factories. The 77,000 pigs of 1902 have increased to 117,553—that is to say, they have increased by over 52 per cent., and this notwithstanding the supply required to produce 4,145,900 lb. of bacon and hams and 940,489 lb. of salt and fresh pork.

The outlook for the coming year is even brighter for the dairying industry than for the year gone by. In agriculture generally, the same progress has been made.

The wheat harvest, in the absence of any available returns, will probably prove to have amounted to over 3,000,000 bushels, or about 500,000 bushels more than in the previous year. A good many wheat farmers are either giving up wheat-growing entirely to devote their land to dairy farming or else are combining the two occupations. In either case the prospect is a pleasing one. Maize, lucerne, and other farm crops have done well. A remarkable instance of the earliness of the maize crop was the arrival of a truck load of the new season's maize from the Darling Downs on the 14th December, 1904. It has rarely, if ever, occurred that maize ripened so early in the Southern district of Queensland.

The sugar crop from Nerang to Cairns has been most successful. The yield of cane has been good in nearly all instances—in some, exceedingly heavy, especially where the cane was irrigated. When the returns have all been collected it will probably be found that the total yield for the State in 1904 has amounted to from 145,000 to 150,000 tons of sugar. The saccharine content of the juice has also been very satisfactory, from 8 to 9 tons of cane

and in some instances 7 tons having sufficed to produce 1 ton of sugar. The total value of the crop, for 60,000 tons of white and 80,000 tons of raw sugars, is computed at a sum of £2,080,000. The excess in value of any previous year amounts to £300,000, and the bonus on the highest quality of refined sugar to £2 5s. per ton. The previous highest bonus only reached £1 19s. 9¼d. per ton.

Whilst the operations of the past year have been so successful, it is imposible to forecast what will be the outcome of Federal legislation during the present year. Much depends upon the retention or abolition of the bonus on white-grown cane. Another disturbing factor is the labour question. At the end of 1906 the kanaka is to be returned to his islands. The loss of 7,000 field hands will, no doubt, be severely felt, as the sugar-growers will hardly be able to find a supply of 7,000 hands to take their places. It is, from this point of view, unfortunate that the crushing season and the wheat harvest should, at least towards the latter part of the year, be contemporaneous. It would need 10,000 men to take off both crops.

The adult male population of Queensland is about 226,000, of whom 81,575 are engaged as working miners, 33,930 as owners or lessees of plantations, farms, orchards, &c.; 9,695 as dairy farmers, graziers, station managers, &c.; 11,189 are shearers, shepherds, stockmen, pastoral labourers, &c.; rabbit and marsupial shooters, well-sinkers, and others engaged in water supply number 1,355. Together, these total 137,744, leaving a balance of 88,256 adult males. Only 4,570 males are returned by the Government Statistician as farm servants or agricultural labourers; 4,669 are engaged as working carpenters, bricklayers, hodmen, &c.; 7,950 are engaged in hotel and lodging housekeeping and as domestic servants; 3,924 are employed in legal work, defence, police, &c.; whilst tutors and teachers account for 1,269. Excluding farm labourers and including 1,000 wharf labourers, there remain 68,175. Now, if we deduct from these 4,570 agricultural labourers and 7,498 workers of undefined occupations, we have a total of 56,107 males who carry out the whole business of the State as professionals, merchants, tradesmen, manufacturers, who manage the shipping business, the railways, the carrying trade, who man the civil service, and whose general business is distinct from agricultural employment.

Taking the cultivated area of the State as 566,589 acres, it will be seen that for this vast area there are, exclusive of working proprietors, only 12,068 farm labourers and casual workers, giving an average of 47 acres per labourer.

During the cane and wheat harvests there cannot fail to be a very serious shortage in available labour, and there appears to be only one way of providing against this; and that is, by immigration. Queensland has been built up by white men. They had cleared the forests and scrubs, settled on and cultivated thousands of acres of land, and covered the face of the country with flocks and herds. They constructed roads, built bridges, navigated the coasts and rivers, and laid the foundation of our large cities and towns. Yet they were men and women brought from the cold climates of Europe, unaccustomed to tropical heat. If money were available, there would be no reason why tens of thousands of similar immigrants should not be found willing to come to Queensland and carry on the work of the country as well as their forefathers, who laboured under ten times the difficulties which have to be encountered by the new settler to-day.

Some hold the opinion that, because work is scarce for a time, there is no room for any more people in the State, but this is a grave fallacy. The greater the population of a country the larger will be its trade and the more numerous its industries, and every additional man, woman, or child introduced into it becomes at once a source of revenue to the State.

That this State is richer than any other State of the Commonwealth in natural resources is admitted on all sides. How those resources can best be developed and utilised is a question for our rulers to solve.

As far as agriculture is concerned, much has been done to induce farmers from the Southern States to settle in the country, and these are taking advantage of the facilities offered them to settle in groups on lands selected by themselves. Such settlers are a distinct gain to the State, for they come to us as farmers experienced in Australian conditions. They introduce not only capital, but their intimate knowledge of Australian rural life. On the success which will, it is to be hoped, attend their efforts, will depend the further influx of such desirable settlers.

The mining industry is constantly expanding, and the comparatively new products, wolfram and molybdenite, have given additional impetus to the mining of minerals other than gold, silver, copper, and tin. The Central districts have developed immense deposits of anthracite coal, and several mining properties are being vigorously prospected. Iron ore also abounds on the mainland and on some of the islands, and promises some day to develop a large iron-producing industry.

We have not space to dilate upon the rich discoveries and prospects of our numerous industries, many only in their infancy or only in embryo, but enough has been said to show the remarkable progress made in most of them during the past year. Everything points to successful work during the coming year.

It is with regret, however, that we have been obliged to curtail the issue of the *Journal* until 30th June next, owing to the general need for economy; but possibly we may after that date, with improved prospects, be enabled to issue the *Journal* monthly as heretofore. Meanwhile we propose to render the bi-monthly *Journal* interesting and useful to our subscribers by means of original articles on the industries of the day, and by publishing whatever we may deem helpful to them from other sources.

Conditions under which the Department of Agriculture will Register Cows in respect to their Milking Qualities.

1. All applications for a test under these conditions to be made through the Secretary of an agricultural and pastoral society.

2. No application will be entertained unless the milking is carried out under the auspices of some recognised agricultural society, and in the presence of some officer of the Department of Agriculture or of some person appointed by the Department for the purpose.

3. Competitors must present a certificate that the cow or cows entered are and have been their property for at least three months prior to date of test.

4. Each cow entered for admission to the Register to be typical of some well-defined dairy breed, and must have a record of not less than 12 lb. of butter a week.

5. Animals qualified will be entered in the Departmental Register, and a certificate of qualifications will be issued.

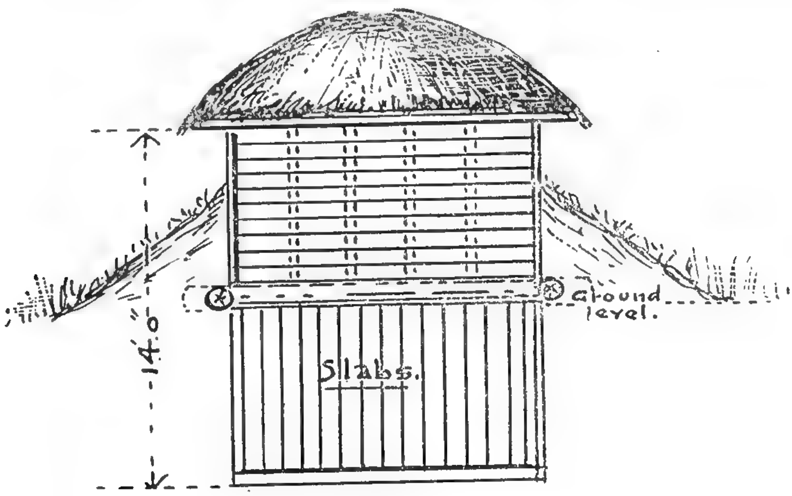
6. The test will cover a period of two days, and will be under the superintendence of an officer of the Department of Agriculture or of some person appointed for that purpose.

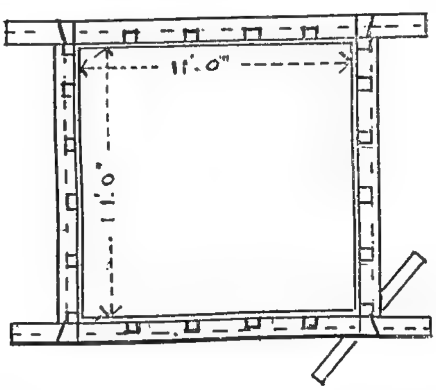
7. All entries must contain a full description of the animals entered, date of calving, breed, time in milk, colour, marks, and brands, &c.

Agriculture.

A USEFUL SILO.

Mr. Fred. Pool, of Oak-tree Farm, Milora, sends us a plan and description of his silo, which he believes to be one which every farmer in the State would take up if he could be persuaded of its value. When studying the shape of his proposed building, he decided to construct it in such away as to have as little of the surface of the silage exposed as possible. The inside measurement was 11 feet wide by 11 feet 2 inches broad, built over a pit 7 feet deep. The building itself is 7 feet high, making a total depth of 14 feet, with a volume of 1,700 cubic feet. Into this he put 36 one-horse dray loads of a green crop of imphee. Our correspondent does not mention the state of the crop, but we presume it was cut at the proper stage, the crop being from 5 to 7 feet in height and barely out in the head. When filling the silo, the butts of the plants were all laid the





same way and pressed tightly against the walls, the flag to the centre, and the whole kept quite level. The next layer had the butts in the centre. The only pressure it got was the treading he gave it. It took ten days to fill. No weight was placed on the silage. It was merely covered with rough hay to the depth of about a foot. As it sank, more was piled on, the silo not being roofed. Cornstalks and hay were then piled on some saplings laid across the walls, which fairly well excluded air and rain. The silage has been 20 months in the pit,

and when the top was taken off it was perfectly good to within 2 inches of the top, but at the side where the rain had run in it was slightly decayed. But it proved splendid silage, the cattle eating it ravenously, and the result is more milk and richer in butter fat than when green oats were fed to the stock.

The silo is constructed as follows:—

The material can be found on most farms. These are:—4 logs, 10 inches in diameter, 12 feet 6 inches in length; 4 logs, 10 inches in diameter, 15 feet feet in length. Two of each length are squared and dovetailed together to form a square base, resting level on diagonal bearers at each corner. Studs are then morticed into the foundation logs, and top plates securely fixed, and the whole firmly braced. Then the silo pit was dug, and slabbed with old rails. These were nailed on to the ground plates and let into the ground to a depth of about 3 inches. The boarding above ground was of 6 inches by 1 inch rough hardwood boards. Then the stuff dug from the pit was thrown against the sides to exclude the air to within 2 feet of the top. The silo was then filled and roofed as described.

No mention is made of drainage, however, which would have to be provided for in a pit excavated to such a depth.

IMPHEE POISONING.

It has been repeatedly pointed out in this *Journal*, both by Mr. J. C. Brünnich, chief of the chemical laboratory of the Agricultural Department, and by other scientific men, that sorghums and all the fodder plants belonging to that family possess active poisonous properties at certain stages of growth. It has been proved, by exhaustive investigation carried on at this laboratory, that sorghum and imphee in the earlier stages of their growth, particularly if grown on rich land, may, in quantities of about 10 lb., contain sufficient quantities of hydrocyanic or prussic acid to poison a cow. Mr. Brünnich further points out that the danger of feeding cattle with young sorghum becomes much greater if used by itself or fed on an empty stomach, and (alluding to a case in point, where a cow was supposed to be poisoned by eating a 10-lb. bundle of imphee) this was most probably the cause of death. The cow in question was being treated for a broken leg.

These fodders should only be cut when the seeds are beginning to form.

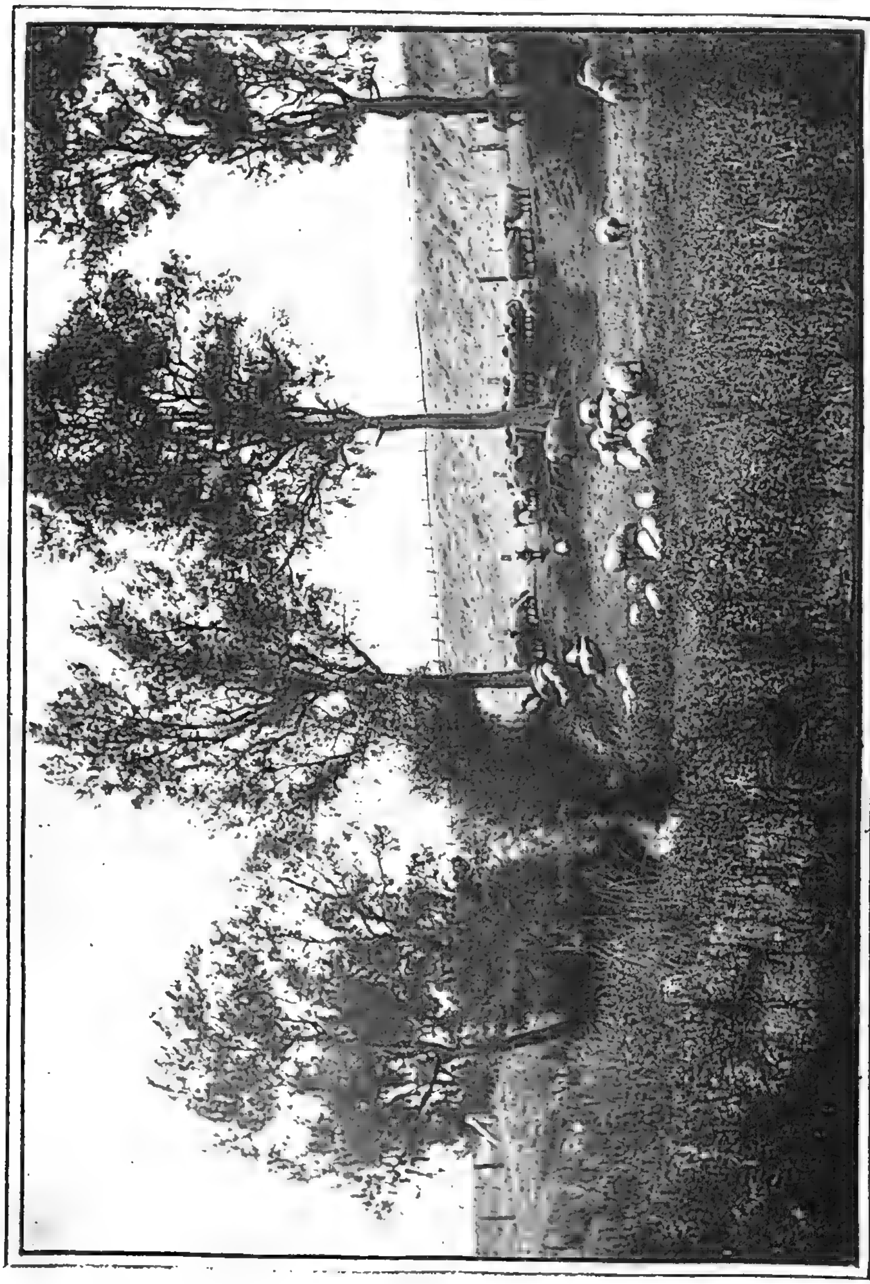
So many authenticated cases of poisoning from this cause have been published that we wonder farmers will not take the simple precaution above indicated.

Hydrocyanic acid is very volatile, and can be driven out to a large extent by allowing the cut plants to wilt on the field. In the case of bitter cassava, which contains this poison in its juice, the ill effects are avoided by the heating of the starch.

THE IVEL AND SCOTT AGRICULTURAL MOTORS.

At a trial of these two motors at the Highland Show at Perth in July of 1904 (says the *Mark Lane Express*) very satisfactory results were obtained, especially with the Ivel machine. The Scott motor worked satisfactorily for a short time, and then had to stop, owing to the non-gripping of a friction clutch. The Ivel motor, to which was attached an Albion No. 3 5-feet-cut reaper and binder, cut 2.75 acres of oats in 1 hour 54 minutes, or at the rate of 1 acre in 41¾ minutes, at a cost of 9½d. for petrol. Later in the day the Ivel was tried at the plough, and experienced no difficulty in drawing a three-furrow plough, ploughing to depths of from 6 to 8 inches. The Scott motor in this trial also met with bad luck, and was compelled to stop several times.

Plate XV.



Shropshire Ewes and Lambs at a Downs Farm, near Warwick.

The exhibitors of the two motors have supplied the following data as to the total cost per acre and the time required for performing the work given below:—

	Total Cost per Acre.		Time Required per Acre.
Mowing	6d. to 1s. 9d.	...	15 to 30 minutes.
Reaping	1s. to 1s. 9d.	...	30 ,,
Ploughing	4s. to 5s.	...	$1\frac{1}{2}$ to 2 hours.
Cultivating	1s. 6d. to 4s.	...	$\frac{3}{4}$ to $1\frac{1}{4}$,,

If the above figures are reasonably correct, it would appear that the cost of motor traction works out at a very cheap rate.

SHEEP ON THE FARM.

By H. C. QUODLING, Director of Agriculture.

Many parts of Queensland, and particularly the large tract of country known as "The Darling Downs," have always been famous for its sheep with their attendant products, first and foremost on account of its situation, soil, and climatic influences; and, secondly, the richness and variety of the natural grasses and herbage.

Of late years, quite a transformation has come about over the whole face of the country; the era when large holdings were the rule has, since their subdivision, given place to a period of latter-day methods which are the natural corollary of closer settlement, in keeping with the requirements and the advance of agriculture and civilisation.

The lessons gained by observation of the methods of the pioneer squatters have not been in vain.

The importance of landholders utilising the natural advantages and turning them to account as an additional means of profit is too great to be overlooked. The present chief source of income for Darling Downs farmers from cereal and lucerne growing, allied with dairying and pig-raising, may be considerably supplemented by the judicious introduction of sheep on to properties capable of carrying them. It is not meant right here to advocate one and all to stock up indiscriminately with sheep, but rather to serve as a subject of careful thought and observation, till such time as the possibilities of the question are grasped, then preparation can be made for taking advantage of a favourable opportunity; but it is better to start down on bedrock in a comparatively small way and work up, till the capacity of the holding is gauged. There may be and are times when a superabundance of feed admits of a departure, when an abnormal number of sheep may be put on in forward condition with a view to fattening and being got rid of quickly, but this policy has its risks, particularly when an unexpected dry spell intervenes.

Fattening-off matured wethers on lucerne after utilising them, to turn surplus growth to account, is one of the branches in which profit exists, providing, of course, that there is a fair margin between prices of stores and fats, with an increased value accruing from the growth of wool.

If there is one thing more than another that the Downs country is eminently adapted for, it is the profitable raising of fat lambs with a view of exporting regular shipments to English markets. John Bull is at heart a connoisseur, willing and able to pay for quality, and has been brought to that pitch by the thorough methods of preparing stock for market which exist in his own country, and also by reason of the enormous amount of imported stuff placed to supply the existing needs of a population which is not self-supported.

It is only too patent that the advantage and initial successes already gained in placing Queensland lambs on the English market should be followed up, but the methods of raising must be strictly with a view of producing lambs of correct age, weight, and quality.

Where areas are somewhat restricted, the profitable raising of fat lambs is brought about more by provision being made in the way of artificial feed than a haphazard manner of depending on the natural conditions.

Water.—First and foremost, a supply of good water is essential, and where running creeks do not exist the immense stores of water obtainable throughout the Downs by sinking to comparatively shallow depths provide a means of tiding over the difficulty.

Pasture.—Lucerne has undoubtedly proved its superiority as a means of carrying and fattening sheep, both on lowland and upland, but the former position (for lucerne) is much to be preferred, as it is not affected to the same extent by the exigencies of the season. Wheat-growers who go in for this industry have a happy combination, as the advantage of eating down crops in late winter and early spring firms the seed bed and reduces over-succulence, also adds well-distributed manure. These factors in combination are conducive to best results. Turnips, kale, vetches, rape, and mustard, also pumpkins, are crops which grow exceedingly well and offer a good choice as a means of supplying substance and variety, suitable alike in most cases for ewes and in part for lambs.

Natural pasture and paspalum, also the feeding over of stubble land and cleaning-up among maize crops when well advanced, are items of maintenance to be met with on many holdings.

The value of sound grass land for wet weather cannot be over-estimated, and is, moreover, a good check to maintain ewes at periods when it is not to their advantage to be flushed with feed.

Shelter and Salt.—In the absence of saline water or herbage, sheep have a greater freedom from disease when there is access to rock salt; placed under shade and in troughs off the ground, it offers more leisure and an additional attraction to avoid the heat.

Rotation.—The keystone to improve the carrying capacity of country is subdivision and rotation in feeding-off, coupled with a system of providing what may be termed catch crops. To graze over or mow lucerne, and follow by good cultivation, encourages its recuperative power. With a rotation, surplus growths may be turned to account and stacked, so that when hard weather intervenes ewes may be kept in a thriving condition. Water and shelter at central positions materially assist in husbanding the strength of a flock.

Selection of Sires.—Purity of strain, conformation, vigour, early maturity, and constitution, coupled with the ability to stamp the good qualities on his progeny, are points worthy of the strictest scrutiny before introducing sires to a flock. It is a well-established fact that many of the disappointments in breeding are often due to a want of knowledge of the antecedents of a sire.

Selection of Ewes.—To form a flock, it is well to obtain quiet, healthy, well-framed roomy ewes, of the strong-woolled merino type, about four years of age, which have had for preference at least two lambs, and are thus more likely to be good mothers.

Purity of strain and evenness of quality are two additional points to be observed.

Mating.—This must be regulated largely by the surrounding factors, so that provision may be made for maintaining the ewe and her progeny in a thriving condition all through.

Regular periods of mating, combined with the removal of rams at night, give best results. Fifty or sixty ewes to each sire will be found ample, if the mating season requires to be short.

Rams are capable of accounting for more ewes, but nothing is to be gained by an act which will reduce the constitution of the progeny.

Lambs dropped in July and early August come at a time for feeding-off cereals, and, as warm spring weather sets in, lucerne, with its more nitrogenous

properties, is the best to grow and fatten on. Ewes suckling lambs are not so liable to get in lamb, although merino ewes have a stronger penchant than any other breed.

Where two flocks are kept, and the next drop arranged for March, after the extreme heat, seasonable rains may be expected to make a spring in the grass, but the July-August lambing is the most favourable.

Dipping, &c.—Shearing and keeping free from parasites reacts to the advantage of the parental flock, whilst it is also found advantageous to shear the lambs under some circumstances.

What to Breed.—To produce early lambs for market on the Darling Downs, the Shropshire Down ram and merino ewe (properly mated) produce a *beau ideal* cross.

Closely allied in conformation is the South Down for the same purpose, whilst some of the most experienced breeders have achieved success by using both of the above types of rams over ewes which are the progeny of Lincoln and Leicester rams and a merino ewe, but merino ewes naturally are better breeders than those crosses which at times carry a superabundance of fat.

Markets.—In the month of January, 1902, during the drought, the Drayton and Toowoomba Agricultural and Horticultural Society offered and awarded a special prize for the pen of thirty lambs best suited for export to London market, the prize to be awarded to the exhibit making the highest average price per lb. when sold in London.

Particulars as follow:—

Individual lambs sold up to 5d. per lb.

Mr. F. G. G. Couper's exhibit of 30 Southdown crossbred lambs, averaging 4.62d. per lb., was placed first.

Mr. F. Wockner was second with a parcel of Lincoln crossbreds, averaging 4.51d. per lb.; while Mr. F. Jennings was third with a consignment of similar breeding at 4.48d. per lb.

Other exhibitors were Messrs. Ralston (two exhibits), Marshall and Slade, Affleck, and the Queensland Cattle Company.

The report received through the London office of the New Zealand Loan and Mercantile Agency Company was most eulogistic.

Mr. F. G. G. Couper, of Westbrook, has taken a leading part in pushing the export of lambs, and has up to the present had 1,100 lambs frozen. More than half that number was sent away during November, 1904, by the "Dorset" to London, and averaged 33.7 lb. in weight.

Messrs. Baynes Bros. also sent away about 1,000 at the end of December, 1904, averaging 38 lb., and expect to follow on this month (January, 1905) with a similar consignment. The firm has consistently pushed this line through the medium of Messrs. Birt and Co., who have up-to-date facilities for chilling and freezing.

Recently I had the pleasure of a visit to this latter firm's works in South Brisbane, who put the various parcels of lambs through referred to above, with satisfaction to all parties, and was much impressed with the extent and facilities for handling all classes of produce and frozen meat for the local and export trade. The standard temperature recognised as most suitable for shipping lambs is from 10 degrees to 15 degrees Fahr.

Carcasses for this purpose, after inspection, grading, and wrapping, are classed as to quality and weight into—

A. 28 to 35 lb.
B. 36 to 42 lb.
H. 43 to 48 lb.

The recently-formed "Downs Lamb Breeders' Association," for promoting the industry, has already met with a good deal of well-merited support, and it is to be hoped that their efforts may be met by that rapid expansion which the importance of the matter warrants.

NOTES ON THE GRAIN HARVEST OF 1904.

By H. C. QUODLING, Director of Agriculture.

The past season has been one of the most successful and should prove to be one of the most eventful periods experienced in the history of cereal-growing in Queensland—first and foremost, on account of the wheat being produced under more normal conditions, resulting in a more general excellence in the quality of the grain; and, secondly, in the most pronounced advance in settlement and development of land within the wheat belt.

It is only to be expected that in the near future, besides supplying all our own wants, outside markets will have to be looked to. The export of some of the season's wheat has already been accomplished, a fair proportion going to Japan. The quality of some of the wheat may be gauged by the fact that it weighed 63 lb. to the bushel, samples being taken from a general average of the bulk. There are some matters of the utmost importance to this State, in order to secure high prices at local and outside markets—

(1) To produce an attractive grain possessing a high glutin content, also good milling and baking qualities, with a minimum of by-products.

(2) To so grade the grain that standard grades may be fixed and a more uniform sample obtained.

It is to be deplored that producers are not more fully alive to the advantages of properly cleaning and preparing grain for market. This is not a general rule, but, unfortunately, there are some who neglect to properly screen their grain before it leaves the thresher. The present complete stripper-harvester machinery generally leaves much to be desired in cleaning and grading.

The want of centrally situated cleaning and grading mills, where grain may be prepared for the world's markets at a cheap rate, will manifest itself as soon as producers become cognisant of its advantages.

The previous season, 1903, was marked and marred by the abundant rainfall. Nature, in one of her capricious moods, had been too bountiful when working out the laws of cause and effect.

Instead of the rank, succulent growth and development to the utmost of the stooling proclivities of the plants, there has been a much more rational balance, due mainly to the fact that the usual spring rains were withheld just long enough to cause the utmost anxiety, and only proved just in time to save the situation. Had the early part of the season been similar to 1903, it would have been almost an impossibility for plants to carry on and supply the amount of evaporation going on daily. Luckily, what with a more general system of thin seeding, followed by a light stooling, individual plants and crops were in a better physical condition to meet and tide over adverse conditions.

One factor which places Queensland on a different plane to the southern States is that, owing to her varied soils and differences in climate, wheat may be grown successfully by commencing to sow during late March in the West up till early August in the South. The choice suitable for sowing within this limit accounts largely for the numbers of different varieties to be met with, but increases the difficulties of securing standard grades of wheat for export.

The confidence in the recuperative powers of the country shown by old and new settlers alike, in putting their best efforts foremost to get more land under crop, has resulted in well-merited success. Settlement has been quietly and thoroughly pushed on with, in anticipation of a run of good seasons, and the propitious weather was taken advantage of to get all available land under crop, which should amount in the aggregate to a quite 10 per cent. increase. Wheat has taken the primary position, whilst there is also a much healthier tone manifested towards barley-growing, due principally to the favourable reports received on oversea shipments and the increased vigour in pushing the malting industry.

Oats have not as yet become as popular as their success warrants, but individual yields on some of the lighter soils of the Downs have given phenomenal results. Algerian, both for hay and grain, seem to be most in favour, although the grain does not possess the attractive and heavier qualities met with in the Tartarian and potato oat types. Unlike 1903, the past season has been one marked by the conspicuous abatement of deleterious influences. Mice did some damage early in the year, but they disappeared almost as suddenly as they came.

At a few places along the Western line wire worms were troublesome when plants were just forming and developing from the embryo stage.

In some restricted areas, where the subsoil was naturally tenacious, or rendered so by hardpan causing indifferent drainage, the disease known as "Take-all" was noted. Mr. Henry Tryon, the Entomologist of the Department, observed the presence of the fungus *Cladosporium herbarum* on wheat plants selected from the affected area.*

The wheat plants' chief enemy—viz., rust—has been very much in the background. Occasionally, where favourable soil and climatic influences have been in its favour, together with the unsuitable selection or time for sowing of a certain variety, its presence has made itself felt on the general life of the plant, but, taking it all through, it is a matter of sincere congratulation that this problem is being grappled with. Practical men have paid much attention to the observation and selection of varieties noted for their rust-resistance. The Department of Agriculture has also afforded a good deal of practical information in elucidating much of what hitherto has been a matter of theory.

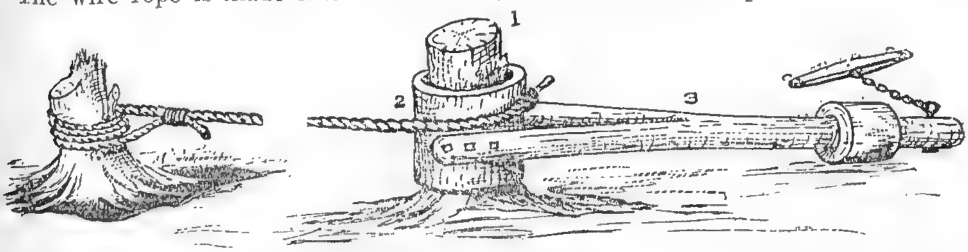
A noticeable feature in some of the 1904 grain, particularly Manitoba, is that the character of the grain is changing and bringing about an alteration in the component parts. Other varieties also have shown the same tendency.

By judicious selection and change of seed this may be overcome, and it is a matter for grain-growers to keep the standard up to as high a pitch as possible to protect their own interests.

AN EFFECTIVE STUMP EXTRACTOR.

Mr. John Morgan, Mount Berryman, sends us the accompanying sketch and description of a stump-extracting machine, which, he says, is simply worked with one horse, and is extremely powerful.

A 12-inch drum is bolted to a forked sapling, and is slipped over a handy stump, round which it works. No tackle is required. A wire rope with a piece of chain at the end is all that is required. The pole is 10 feet long. The wire rope is made fast to the drum, and the other end passes round the



stump. No knot is used. As the horse moves round, a force of 20 tons is thus exerted, and no difficulty is experienced in dragging out very large stumps. The tackle can also be used on standing timber, care being taken to so arrange, by means of a tackle, that the tree falls away from the horse.

The drum may be made in two halves, to avoid lifting over a stump. The halves are simply placed against the stump, and are bolted together. The cost of the whole outfit would only be about £2. One man and a boy can stump half an acre a day with the machine.

* This, as he points out, indicates that it was not the disease usually designated "Take-all" in other localities.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH SEPTEMBER, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Amy ...	Ayrshire	5 June, 1904	671	3·8	28·55	
Lass ...	,, ...	12 Mar. ,,	656	3·9	28·65	
Lowla ...	,, ...	3 Mar. ,,	610	4·0	27·32	
Lightning ..	,, ...	15 Jan. ,,	653	3·6	26·39	With first calf
Laverock ...	,, ...	17 July ,,	911	3·7	37·75	
Rosebud ...	,, ...	27 Nov., 1903	626	4·2	29·44	
Ruth ...	,, ...	15 Dec. ,,	551	4·0	24·68	
Dainty ...	Shorthorn ..	14 July, 1904	735	3·6	29·63	With first calf
Kit ...	,, ...	26 Mar. ,,	712	4·0	31·89	
Pleasant ...	,, ...	20 July ,,	814	3·6	32·82	With first calf
Queenie ...	,, ...	22 Mar. ,,	681	3·6	27·45	
Rose ...	,, ...	19 July ,,	997	3·8	42·43	
Roany ...	,, ...	17 July ,,	978	3·7	40·51	
Winnie ...	,, ...	5 Aug. ,,	770	3·8	31·77	
Carrie ...	Jersey	16 Jan. ,,	433	4·5	21·82	
Effie ...	,, ...	22 June ,,	717	4·7	37·74	
Eileen ...	,, ...	29 July ,,	554	4·4	27·20	
Jersey Belle	,, ...	2 Mar. ,,	431	4·9	23·75	
Mona ...	Holstein Sh'rth'rn	1 Aug. ,,	1,062	3·6	42·81	
Magpie ...	,, ,,	9 July ,,	897	3·9	39·07	With first calf
Angel ...	Holstein Devon...	11 Mar. ,,	623	4·4	30·70	
Whitefoot ...	,, ,, ...	20 June ,,	827	3·8	35·29	
Reanie ...	Holstein Hereford	21 Sept., 1903	647	4·0	29·98	

RETURNS FROM 1ST TO 31ST OCTOBER, 1904.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Amy ...	Ayrshire	5 June, 1904	648	3·7	26·85	
Lass ...	,, ...	12 Mar. ,,	588	3·8	25·02	
Lowla ...	,, ...	3 Mar. ,,	527	3·7	21·83	
Lightning ...	,, ...	15 Jan. ,,	508	3·6	19·47	With first calf
Laverock ...	,, ...	17 July ,,	747	3·8	31·79	
Rosebud ...	,, ...	27 Nov., 1903	531	3·9	23·19	
Ruth ...	,, ...	15 Dec. ,,	545	3·9	23·82	
Dainty ...	Shorthorn ...	14 July, 1904	509	3·8	21·66	With first calf
Kit ...	,, ...	26 Mar. ,,	604	3·6	24·35	
Pleasant ...	,, ...	20 July ,,	700	3·5	27·44	With first calf
Queenie ...	,, ...	22 Mar. ,,	618	3·7	25·60	
Rose ...	,, ...	19 July ,,	841	3·7	34·85	
Roany ..	,, ...	17 July ,,	891	3·6	36·00	
Winnie ...	,, ...	5 Aug. ,,	604	3·7	25·02	
Carrie ...	Jersey	16 Jan. ,,	294	5·0	16·46	
Effie ...	,, ...	22 June ,,	606	4·2	28·50	
Eileen ...	,, ,, ...	29 July ,,	428	4·5	21·57	
Jersey Belle	,, ...	2 Mar. ,,	422	4·6	21·74	
Mona ...	Holstein Sh'rth'rn	1 Aug. ,,	968	3·7	40·11	
Magpie ...	,, ,,	9 July ,,	801	3·6	31·29	With first calf
Angel ...	Holstein Devon...	11 Mar. ,,	287	4·7	14·29	
Whitefoot ...	,, ,,	20 June ,,	676	3·6	27·26	
Reanie ...	Holstein Hereford	21 Sept., 1903	570	3·6	22·98	

QUEENSLAND AGRICULTURAL COLLEGE.

ANALYSIS OF "COLOSTRUM MILK" FROM COW MONA.

The following are analyses of "colostrum" (milk from a cow newly calved) from the half-bred Holstein cow Mona:—

Day after Calving.		Sp. Gr. 15.5° C.	Water.	Total Solids.	Fat.	Proteids.
			Per cent.	Per cent.	Per cent.	Per cent.
FIRST	Morning	1.0459	85.62	14.38	2.23	6.03
	Evening	1.0405	85.06	14.94	3.94	6.72
SECOND	Morning	1.0441	84.62	15.38	3.41	5.88
	Evening	1.0400	84.42	15.58	4.60	5.58
THIRD	Morning	1.0393	85.09	14.91	3.97	5.05
	Evening	1.0390	84.40	15.60	4.84	5.05
FOURTH	Morning	1.0388	85.38	14.62	3.99	5.05
	Evening	1.0340	85.20	14.80	5.20	4.23
FIFTH	Morning	1.0385	86.27	13.73	3.18	4.21
	Evening	1.0329	83.57	16.43	6.61	4.23

From the above analyses it may be observed that the milk from a cow that has newly calved does not reach its normal condition for a period of at least five days after calving. The very high total of solids and fat on the fifth day may be explained by the fact that on this particular day the milking took place about six hours after the morning milking, owing to the cow's removal to the Brisbane Exhibition; otherwise the analyses show very plainly the change of colostrum to normal milk, the change being particularly noticeable in the lowering of the specific gravity and in the regular decrease of the proteids.

ANALYSES OF SEPARATED MILK.

The following are analyses of separated milk from the different breeds of cattle at the College:—

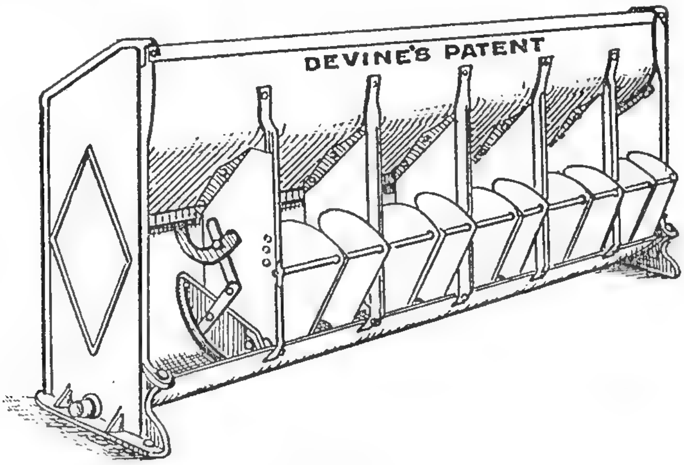
Breed.	WHOLE MILK.	SEPARATED MILK.		
	Percentage Fat.	Percentage Fat.	Total Solids.	SP. G. 15° C.
Ayrshire	3.6	.265	9.12	1.0350
	3.8	.262	9.08	1.0347
Holstein	3.4	.193	9·19	1.0356
	3.5	.183	9.15	1·0352
Jersey	4.2	.155	8.30	1.0356
	4.1	.183	9.00	1.0332
Shorthorn	3.6	.181	9.18	1.0355
	3.7	.183	9.17	1.0353

The milk from the different breeds was placed in separate cans and separated each day, and a sample was handed over to the chemist, who carried out the analysis.

The analyses show that breeds whose milk contains fat globules of the smallest size yield more fat in the separated milk. Opinions differ very much in connection with this matter, and for this reason I caused the analyses to be made.

UP-TO-DATE PIG-MANAGEMENT—PREVENTING SWINE FEVER.

Mr. Arthur Robinson, Adelaide street, Brisbane, agent for many useful novelties for house, farm, and station, has now on view at his rooms, 57-59 Adelaide street, a pig trough of novel construction, which combines the essential elements to successful pig-breeding—cleanliness, the certainty of every animal getting its proper share of food, and prevention of contamination of the latter by the pigs' feet. This contrivance is the invention of a noted breeder of pigs in Victoria, Mr. P. J. Devine, of Yarragon, Gippsland. It is so constructed that the sow cannot feed in the compartments designed for the young pigs.



The new troughs are made of sheet iron, 6 feet long by $2\frac{1}{2}$ feet high, each trough being divided by partitions into feeding compartments for the accommodation of six fattening pigs each, while further adaptable for breeding sows with litters by the introduction of additional partitions (removable at will) converting five of the compartments into ten for the young pigs, whilst the sixth, at the end, is retained for the sow at its full size. It is impossible for a pig to get its feet into the trough, because, pushing inward to do so is rendered impossible by the sheet iron wall which forms the back portion of the trough, rising as an effectual barrier, which comes into contact with the pig's face and pushes the animal back upon any attempt being made to get its feet into a place only intended for its mouth. As the whole apparatus is constructed of sheet iron with cast-iron ends, it can be expeditiously cleaned, and all germs of disease thoroughly destroyed. In fact, the trough could be placed on a big fire without injury. This is the most valuable invention we have ever seen in pig troughs, and every breeder should at once discard the old disease-stricken wooden troughs in its favour. The price of a five-stall trough is £3 14s. 6d.

DEHORNING CATTLE.

By JOHN MAHON, Principal, Queensland Agricultural College.

The practice of dehorning cattle has been carried on in Scotland, Ireland, Canada, and the United States of America for a number of years. In England, during the year 1888, the Royal Society for the Prevention of Cruelty to Animals brought the matter before the Blomfield Petty Sessions, which was presided over the Lord Chief Justice and Mr. Justice Hawkins, who adjudicated against the practice on the grounds of cruelty to animals. The law has since reversed this decision in favour of the practice. The dehorning of cattle may be considered to be painful to the animal, and no doubt it is, but the pain is of such a short duration that the suffering is but a minor matter in comparison

with the pain that may be caused by horning. Dehorning should be strongly encouraged in the case of animals intended for human consumption. It is a known fact that horned cattle injure each other considerably, not only in the paddock, but also in the drafting-yards, railway wagons, sale and slaughter yards. By the animals using their horns as weapons of defence, many are injured to such an extent that they have to be condemned as unfit for consumption. It is also known that polled or dehorned cattle are much quieter and more easily handled than those who possess these weapons of defence. In the case of purebred stock or dairy cattle, that are quiet and easily handled, these is no necessity for dehorning, because it would spoil the appearance and character of the anmials. It is a notable fact that there are fewer lumpy or diseased cattle among the polled than among any other breeds, brought about by the fact that they are unable to injure each other. The operation of dehorning is very simple. The calf should be operated upon when from four to six weeks old, and before the young horn shoots through the skin. If the operation is carried out after the horn has protruded, it will be far more painful. To perform the operation, the calf may be held by an assistant, when the operator cuts the outer skin of the top of the horn bud deep enough to remove the hard skin. A preparation known as "horn-killer," which is composed of caustic potash and lime, is applied and rubbed in until the surface sears or turns brown and bleeding stops. Two shillings' worth of "horn-killer" is sufficient to treat over 150 calves. For older cattle, the appliance known as the "Keystone Dehorner" is used, but the caustic potash is employed in the case of calves. If an animal pass the age of three months before being dehorned, it should be allowed to run on to nine months or over, by which time the horn will have developed sufficiently to have a hollow in the core. If dealt with younger, the solid piece of core left will continue to grow and produce a snailey horn. In the case of full-grown animals, the operation should be carried out during a favourable season, when the weather is cool and there is freedom from flies.

THE VINEGAR CURE FOR SNAKE-BITE.

The Rev. Edwin Brown writes from the Weipa Mission Station, Cooktown:—

"It is now my pleasant duty to thank you for the vinegar snake-bite cure as given in the *Journal* some time ago. When I read it there, I made a mental note thereof, in case we might some day need it. After a long time, the day came on the first of last month, November. On that day one of our men here (aboriginal) was badly bitten on the heel by a black snake. The reptile twisted itself round his leg, and took such a hold on the heel that when he shook it off it took a piece of skin with it. He then walked home, a distance of about 150 yards, and informed us. By this time he was feeling rather bad, and glad to lie down. I immediately got my knife and made some good gashes, and started rubbing in vinegar, someone having meanwhile tied a ligature around the thigh. For a while the poison gained on us, and he became so low that we gave him a dose of brandy. The vinegar rubbing was continued for a space of about two hours, over a quart being used. Then the patient drank a cup of tea and smoked a cigarette, and we concluded that the danger was past. But about an hour after, during which he had alternately chatted and dozed, he had a kind of fit, which lasted for a few minutes until he had had another dose of brandy. We then put an ammonia-soaked rag on the wound, and tied it up. But the cure was complete, and in a couple of days he was all right, except for the soreness of the heel where he was gashed and rubbed. This cure, therefore, we attribute, under God's blessing, to your vinegar cure; and you may be sure we are grateful to you for having 'passed it on.'"

This is the third cure reported to us since the remedy was first given in the *Journal* in January, 1903.

The Horse.

THE IMPROVEMENT OF HORSE STOCK.

By JAMES MOFFAT ("ARAB").

My interest in good horses caused me to offer evidence before the Select Committee appointed by the Legislative Assembly to consider and report what steps be taken, if any, through the medium of legislation to improve the horse stock of Queensland.

My contention is that the influence of the modern turf is responsible for the deterioration of the modern English thoroughbred, and this deterioration of the thoroughbred has not only arrested the improvement of English horses, but has become a great factor in the deterioration of the horses of the Empire.

The evidence given before the Select Committee all but unanimously ascribes the cause of deterioration to "indiscriminate breeding."

This has been my contention for the past thirty-six years. Lord Lonsdale in his evidence endorses all I have ever advanced as to the bad results arising from the introduction of inferior English breeds.

But Lord Lonsdale, in answer to question No. 449, says there has been no deterioration of the English thoroughbred.

As a practical horseman, I say the present-day conformation of the English thoroughbred is not what it was in England in the early half of last century, nor what it was in Australian thoroughbreds less than forty years ago, and I further assert the old style was, for every purpose, excepting that of the modern turf, superior to those bred on the present-day lines of conformation of the modern English thoroughbred, and maintain this structural change constitutes deterioration.

In reply to question No. 662, I stated the present-day thoroughbred was now deteriorating the horse stock.

Lord Lonsdale suggested several questions, which all served to indicate the distinct difference of ideas which exists between the English and Scotch schools of horse.

One of those suggested questions was No. 671: "You may remember that Eclipse, from the top of his wither to the tip of his shoulders was 64 inches. Hermit, another excellent racehorse, which won the Derby in 1887, was 77 inches?" This question is not clearly put; still it serves to indicate the difference which exists between the English and Scotch schools of horse, of which Lord Lonsdale and myself are representative exponents.

The English school requires a deep shoulder, and Lord Lonsdale, as its representative, evidently considers the added inches to the depth of Hermit's shoulders to have been improvement. On the other hand, the Scotch school—and it is in agreement with the Arab school, and also with the school which built up the old type of English thoroughbred—exacts a well-packed-up shoulder, which is rarely, if ever, found in conjunction with a deep shoulder, and the Scotch school asserts a deep shoulder to be deterioration when it is obtained as it is in the modern racer by lessening the acuteness of the angle of the shoulder bones.

Another suggested question, No. 684: "Has the Arab a good shoulder?" is also indicative of the different views held by those two different schools.

The Arab's shoulder gives his good knee action and clever lift of hoofs, and also the effective forward reach of his forelegs when stepping. On the other hand, the deep shoulder of the modern thoroughbred, obtained as it is by opening out the pack-up of the shoulder bones, gives poor knee action, a toe-dragging lift of hoofs, and loss of the effective forward reach of the forelegs in action; at same time it gives greater capacity to reach back with the forelegs,

which, when racing, lends itself to speed, but for every useful purpose it constitutes deterioration, as, when under great exertion—whether in pulling, walking, trotting, or racing—horses with this shoulder get too much in front of the centre of gravity and become dangerous on account of their proneness to fall.

The casualties from this on our racecourses are becoming appalling; the men put out of action from this cause during the South African war were discreditable to the intelligence of the Empire's horse-breeders. And the fatal accidents which have become so common from the same cause in our home every-day work is not flattering to the practical knowledge of horse-breeders of this State.

I have given much thought to this horse problem, and am not optimistic as to improvement; as, with the two different schools in practice, "indiscriminate breeding of conformation is bound to go on."

That the English thoroughbred—originally built up to impart Arab lines and qualities to English horses—should have become through turf influences unfitted for this purpose is a fact much to be regretted in the interests of improvement of the horse stock.

To hear assertions made that the English thoroughbred has not deteriorated makes me impatient when I recall specimens of the old type of thoroughbred I have worked with; one, a colt by Glaucus, specially coming to my mind as I write—an outlaw that could not be ridden quiet, put into draught he was a perfect pleasure. During fifty years' experience I cannot recall working a horse whose conformation was better fitted for purposes of draught.

Had our thoroughbreds been retained on the old lines of conformation such as the Glaucus stock were, we would not to-day be bewailing the deterioration of our horse stock.

THE MEXICAN TREE COTTON.

In a recent issue, says the *American Cotton Manufacturer*, we gave a brief description of a few samples of Mexican tree cotton which had been sent to this office by one of our correspondents in the city of Mexico. A closer examination of the four specimens sent reveals a quality that can be considered as a commercial fibre.

We are informed that the cotton was taken from trees which are growing wild in the State of Jalisco, which lies on the west coast of the country, being one of the central States. At a few places the product of the trees is being made into coarse cloth by the natives. The yield is continuous, and everything indicates that this arboraceous variety may be made a commercial success, not only in its native habitat but in the United States, since it is said that not only is the yield continuous, but that the tree will stand both frost and drought.

THE STAPLE.

There are four distinct samples—two are very white and silky, while the others are rather harsh, one being evidently much stained. The staple of the four lots runs from $1\frac{1}{16}$ inches to $1\frac{1}{4}$ inches; one sample contained an abnormal amount of waste, but the others were remarkably uniform in length. The strength of the fibres is a prominent characteristic, being, if anything, stronger than a "peeler" cotton of the same length. All the samples would make excellent yarns and goods with one exception, which was weak and only suitable for the making of filling yarns for fabrics which require a soft oozy thread. The seed is smooth and black, resembling much that of the American Sea Island variety.

Poultry.

POULTRY FOR EXPORT.

BY M. FERN.

With the facilities we now possess in the regular calling of oversea vessels with ample cold storage accommodation, there is reason to believe that poultry can be placed in good condition on the English markets, and if the quality is good and the right season be availed of for shipping, payable prices should be realised.

The difference in season between Queensland and England places us in the position of being able to supply the home markets at a time when prices are at their highest—viz., from January to June. Between those months, supplies from Russia, France, and America have slackened off, and home-grown birds are very scarce. Our early-hatched birds, say from June to October, can be got ready by topping off, and can be placed on the market at their best.

As an adjunct to farming, particularly grain-growing, poultry-raising for export should prove very profitable. Take our wheat and barley districts. If the farmer had incubators going whilst his grain was growing, he could by harvest time have a large number of chickens running about, and when his crop was harvested these could be allowed to roam about, and could be got into splendid market condition at practically no cost. Small movable houses on wheels could be used, and the youngsters be given free range during the daytime, and at night they would sort themselves into their various houses. The last three or four weeks before sending them to be killed, they could be confined in small enclosures and fattened up. During this time all food, such as oats, barley, and wheat crushed, should be given in a ground state; and this food, moistened with skim milk, would greatly improve the colour and texture of the flesh, and would greatly add to the plumpness of breast, which is the real test as to the value of the bird for table use.

The grower of poultry should realise that, as in the case of all other commodities, it is the production of the best that gives the greatest profit. On the production of second quality there is only a very narrow margin of profit; so he should aim for the best.

What is required on the English market is a small bird, say from 3 to 4½ lb. in weight, plump-breasted, white-fleshed, and, if possible, with white legs; the request for white legs is dying out, but the other points are insisted on.

The best fowl on the London market is the far-famed Surrey fowl. This class of bird, originally bred in Surrey, was chiefly Dorking and Dorking crosses, but of late years the name has lost its significance and is now really a name for first-quality birds. The best authorities declare that first-rate Irish and even foreign birds are passed off as Surrey fowls, and that not more than 20 per cent. of the poultry sold in London can claim to be home-grown.

The following illustrations will give a much better idea than any written description of the styles of bird sold in London, and will show the grower the type of bird to be aimed at in breeding for market.

What is regarded as the best cross on the London market is the Indian Game-Dorking, although Indian Game-Buff Orpington have lately been giving them a very close run, and at the leading shows of dead poultry in England the latter cross has held its own. A leading English poultry farmer gives interesting details of three years' running of a poultry farm, and speaks highly of this cross—viz., Indian Game-Buff Orpington; his average price for market birds being 3s. 2d. to 3s. 5½d. per bird.

Plate XVI.

NORFOLK TURKEY

Approximate value in Christmas week, 9*d.* to 1s. 4*d.* per lb.

FRENCH TURKEY

Approximate value in Christmas week, 8½*d.* to 1s. 2*d.* per lb.

This cross would suit our climate much better than the Dorking cross, the Orpington being one of the hardiest birds we have with white flesh, and the buff variety has white legs. It is a very quick grower, and in this respect alone is much superior to the Dorking, which is not a fast grower, nor is it as hardy, although when grown the Dorking is certainly an ideal table bird; yet, in our climate, I would prefer the Orpingtons.

The purebred Orpington itself would make an excellent export fowl, and in many cases where the farmer desires eggs as well as flesh it would be superior to the cross. By using the game cross, egg-production would go down, as the Indian game are such poor layers.

I think a good plan is, for the farmer to go in for the Orpington as a general-purpose fowl, keep his pullets as layers, and export his surplus males. If farmers would go in more for this class of fowl, they being winter layers, a

DEVONSHIRE FOWL
8½d. to 10d. per lb.

SURREY FOWL
9d. to 1s. per lb.

more even price for the eggs would be maintained, and they would not be disturbed at only 4d. per dozen being paid in Brisbane at Christmas time; so that the farmer, by using more of the heavier breed of fowls, not only improves his flock from a market point of view, but also for egg-production. The fault at present consists in the too general use of the lighter breeds, such as Leghorns, Minorcas, &c. These birds will never make good export birds, and when to this you add the evil of careless in-breeding it is no wonder that such low prices rule for table poultry, and that eggs are all laid at one time of year, resulting in an alternation of a feast and a famine.

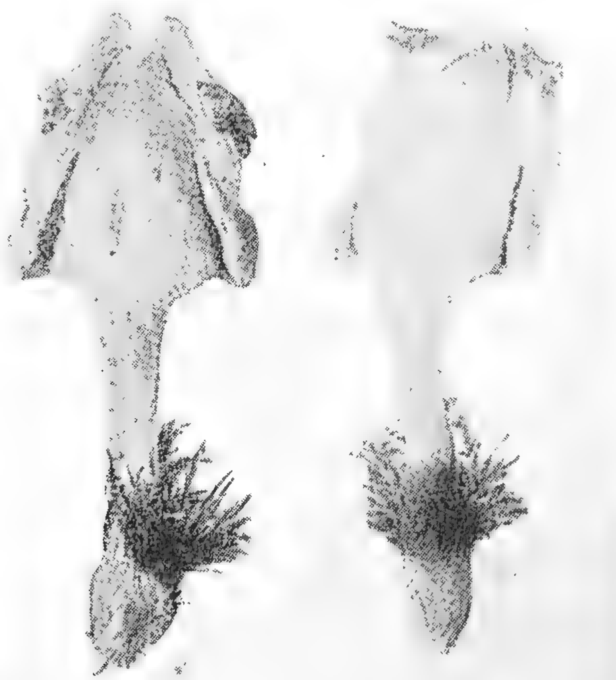
From the marketing side of the industry, the Wyandotte, I think, comes second to the Orpington. As a layer it is superior to the Orpington, but loses in colour of flesh, which varies from a creamy white to yellow. The legs are yellow. The colour of the flesh can be very considerably improved by discarding maize as a food and using the before-mentioned crushed grain.

If the game cross is desired, the Old English game male should be used, as it is not advisable to cross two yellow-fleshed birds. The Indian game being a

creamy colour, this cross will not, of course, produce such good layers as the pure Wyandotte, which, as a general-purpose fowl, takes front rank. Plymouth Rocks may also be used with the Old English game cross; they are also inclined to be yellow in flesh and leg.

There are plenty of other crosses possible, those mentioned being about the best. Of course in crossing the definite object of producing the desirable plump breast and white flesh must be kept steadily in view.

Ducklings also find a ready sale at the same time of year. Young birds only should be sent, adult ducks not being wanted. They should be plump, and weigh not less than 3½ lb. White birds are preferred. The breeds most



BOSTON FOWL.
Approximate value in Christmas week, 8½d. to 9½d. per lb.

ESSEX FOWL.
Approximate value in Christmas week, 8½d. to 9d. per lb.

suitable are Aylesbury and Pekin—both pure and crossed each way. The illustration shows the style of bird of this cross as compared with the Russian duck.

Ducklings can be got ready for market in a much shorter time than chickens. At from ten to twelve weeks old they should be ready by careful feeding. For the last three weeks they should be fattened by giving them soft food. A good ration is 3 parts each of bran and cornmeal, 1 part low-grade flour, and 15 per cent. meat scraps. Green food and grit should be given, and the birds should not be allowed to swim.

As in fowls, evenness of size and quality are greatly to be desired; the London salesman pays a great deal more attention to the quality of a lot rather than to individual excellence, so that great care should be given to the grading of all stock for export.

Turkeys find a ready sale on the London market at Christmas time. After that, except for poults, the prices are not very tempting. For the heavy birds, very high prices are obtained at the festive season, and, although turkeys are hard to rear in their early stages, this branch of the poultry industry should

pay well, particularly in our Western districts, where they can be so cheaply raised on stray seeds and grain and grasshoppers, on which diet they seem to thrive splendidly. During my Western trip I found that they were being largely raised in prickly-pear country, and were given free range, practically earning their own living. They should be prepared for market by fattening, as this will pile on the flesh and improve its texture and flavour.

The illustration shows the Black Norfolk turkey, a very hardy breed. This breed, crossed with the Bronzewing, gives a splendid market and a fairly hardy bird. The pure Bronze, of course, gives great size and good quality of market turkey.

The great secret of success is the last few weeks of preparation for market. Birds picked up straight from the run cannot expect to compete with the fattened bird. Fattening undoubtedly pays, and the success of this branch of

RUSSIAN DUCK
Approximate value in Christmas week, 8d. to 10d. per lb.

PEKIN-AYLESBURY DUCK
Approximate value in Christmas week, 8d. to 10d. per lb.

the industry is plainly shown in the Surrey fattening stations. Not only is the weight increased, but the quality also is greatly improved. A bird weighing, say, 3 lb., valued at 6d. per lb., could be transformed in three weeks into one weighing 4 lb. and worth 9d. per lb.

It is hoped that the trial shipment of poultry to be made by the Department of Agriculture will prove successful, and that the quality of the birds sent to be treated will be up to English requirements. The market exists—the means of transit and treatment are assured, and it only remains for the breeders to send the right class of bird, when a large and paying business will in all probability follow. The demand for good stock is almost unlimited, and owing to our favourable conditions of climate, &c., we have every chance of success in the business of growing poultry for export.

The Orchard.

WHY GROW INFERIOR MANGOES?

By ALBERT H. BENSON, M.R.A.C.

Of all the fruit trees grown in coastal Queensland outside of frost areas, none is easier to propagate, makes more rapid growth or produces greater returns, taking one season with another, than the mango. It thrives in all kinds of soil, is a great drought-resister, stands neglect better than any fruit tree, and is not seriously injured by any fruit pests, though some varieties are very subject to the attack of fruit pests, especially the pink wax scale. Where the climate suits it, it is as hardy as the apple-trees of Old England, and will stand as much neglect as those trees; in fact, it may be considered to be the apple of Queensland. Despite these advantages, it is the one fruit whose propagation on up-to-date lines has been almost entirely neglected, and yet no tree is easier to propagate. The common method of reproduction by seedlings is often very unsatisfactory, the result in many cases being the production of inferior fruits that are not only hard to dispose of at any price, but which, when sent to distant markets, spoil the sale of good fruit, as one cannot blame persons from condemning the mango as a fruit when their only experience of it has been with the fibrous, turpentiny, or carroty abominations so frequently sent to market. Now, there is no reason why we should continue to propagate these very inferior kinds when it is just as easy to produce fruit of the finest quality.

In the *Queensland Agricultural Journal* for July and August, 1900, and for January, 1904, there are articles by Mr. Horace Knight, of Rockhampton; and the writer, dealing with the working over of inferior varieties with the best kinds, or the propagation of the best kinds in the nursery, shows clearly how easily this may be done. The method described—viz., that of plate-budding—was clearly shown and illustrated, and yet few growers have taken the trouble to avail themselves of the information. Many have said this process of working over is all very well for the North, but it will not answer down South; and my reason for writing this short article is to show that it is equally applicable to the South if only done at the right time of year.

On the 20th of February, 1904, Mr. McDonnell, of Boggo Road Junction, Brisbane, put on ten buds on a mango-tree, some twelve years old, growing in the garden of Dr. F. G. Connolly, South Brisbane. Six of these buds grew, and the tree showing the growth made from these buds was photographed by Mr. Mobsby, of this Department, on the 9th of January, this year. The photograph is reproduced herewith, and shows the perfect union that the buds have made with the stock, as well as their vigorous growth of less than eleven months. The union of the bud with the stock is clearly shown; it is a solid union, not a mere temporary attachment, and there is little fear of it breaking away from the stock.

What has been done successfully by Mr. McDonnell can be done by any orchardist, the secret of success being that the bark of the stock must run freely, and that for this part of the State the buds must be put in during the months of January and February. The buds are taken from trees producing fruit of special merit, and the result will be the conversion of inferior varieties into sorts that will meet with a ready market anywhere, and thus tend to make a good name for this very fine fruit in place of the very unsatisfactory one it often bears. In other words, when the propagation of or conversion into really good kinds is so simple, Why Grow Inferior Mangoes?

Plate XVII.

Grafted Mango, in Dr. F. G. Connolly's Garden.

GRAFTING THE MANGO.

On this subject, Mr. D. O'Connor, Oxley, who has for years made the cultivation of the mango a study, writes:—

It is remarkable we hear so little on the above subject, seeing it is one of such great importance to every person who grows mangoes, as it enables them to convert their trees that bear inferior fruit, as most do, into producers of choice fruit. To Mr. Horace Knight, of Rockhampton, is due the credit of discovering the ingenious process of which Mr. G. Marshall Woodrow, who is recognised as the best Indian authority on the mango, says in his little work "The Mango," which should be in the hands of every mango-grower:—"That the mango could be propagated by 'bud-grafting' or 'budding' has long been the faith of everyone who has studied the habits of the tree, and the writer has made many attempts in India to accomplish this desirable process, without success; but a suitable method has been discovered by Mr. Knight, in Queensland, who published his results in the *Queensland Agricultural Journal*, July-September, 1900, and it was discovered independently by Mr. W. G. Oliver, in Florida, who published his method in the *Florists' Exchange*, New York, April, 1902. There is no material difference in the systems employed by the fortunate operators, who are voted the heartiest congratulations by all who know the subject of their work."

Mr. G. N. Collins, Assistant Botanist in Tropical Agriculture, United States Department of Agriculture, notes in Bulletin No. 28, 1903:—"What appears to be an entirely new method of budding is described by Mr. Knight, of Queensland, in the *Queensland Agricultural Journal* for July-September, 1900 (page 256), under the name of 'Bark-grafting.'" Mr. Collins then describes the process at full length, and describes the photographs.

Mr. Horace Knight's discovery is fully appreciated so far away as India and America, but it is so little valued in Queensland that Mr. Knight has given up gardening and taken to mining; this does not speak well for the good sense and enterprise of Queenslanders. I have been told by some gardeners: "The process may be successful in Rockhampton, but is not in Brisbane—the climate is against it." It is, however, satisfactory to say I know of three places in which it has succeeded:—Mr. Horace Burkitt's, who writes of his experiment in December, 1903, of your *Journal*; Dr. Connolly's, of South Brisbane, whose tree I saw in company with Mr. Benson; and Mr. MacDonnell's, of Ipswich road, South Brisbane. Mr. MacDonnell operated on more than a dozen trees successfully in January, 1902, many grafts on each tree. I saw fruit on three of these trees. Dr. Connolly's tree was worked by Mr. MacDonnell with his own buds.

It should be noted that February is the best month for budding the mango.

REMEDY FOR TICK FEVER.

In accordance with instructions from the Chief Inspector of Stock, Mr. A. H. Cory, M.R.C.V.S., Veterinary Surgeon to the Stock Department, reports that up to the present time the best treatment he has found for cattle suffering from tick fever or redwater is as follows:—

On the first symptoms of the disease being noticed, a large dose of Epsom salts is given—$\frac{3}{4}$ lb. to $1\frac{1}{2}$ lb.—in about 5 pints of water, followed every four hours by giving 40 grains to 60 grains of quinine with $\frac{1}{2}$ oz. of carbonate of ammonia in a pint of *cold* water or gruel. Some 3 or 4 lb. of treacle can be added beneficially to the drench when the salts are given.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order RUTACEÆ.

BORONIA, Sm.

B. falcifolia, *A. Cunn.*; *Benth.* Fl. Austr. I., 322; **var. alba.**

Hab.: Peel Island, *Wm. Soutter.*

A month or so ago Mr. J. H. Maiden, the Government Botanist of New South Wales, sent me a specimen of this species, gathered at Stanthorpe, of which many of the leaves were 5-foliolate, and since then Mr. Wm. Soutter sent me a specimen, gathered at Peel Island, with even more pronounced 5-foliolate leaves, usually on the lower portion of the stems. Thus persons having the "Queensland Flora," at page 188, line 31 from top, should, after 3-, write 5-.

Order LEGUMINOSÆ.

HARDENBERGIA, Benth.

H. monophylla, var. longiracemosa. This is the *Kennedya longiracemosa*, Lodd., Cab., t. 1940, and differs only from the normal form in the leaves resembling more those of *var. ovata*; flowers pinkish, in long slender racemes.

Hab.: Peel Island, *Wm. Soutter.*

ACACIA, Willd.

A. rubida, *A. Cunn.* In *Field*, N.S.W., 344; Benth. Fl. Austr. II., 366. A tall shrub, quite glabrous; branchlets angular, often of a reddish-purple, the perfect bipinnate foliage of the genus being produced much longer on the branches than is usual with other phyllodious species. Phyllodia lanceolate, often falcate, the acute point more or less hooked, much narrowed towards the base, mostly about 3 in. long, rather thick, 1-nerved, with red nerve-like margins, the veinlets inconspicuous, marginal gland 1 or wanting. Racemes shorter than the phyllodia, with several, often 10 to 12, rather small heads of 10 to 15 flowers, mostly 5-merous. Sepals half as long as the petals, usually coherent. Petals smooth. Pod not seen.

Hab.: Near Stanthorpe. I have several times received specimens of this Acacia from near Stanthorpe, at first from Mr. J. Davidson in the year 1876-7, but none of these specimens bore either flowers or pods, so I could not say to what species the specimens belonged. Mr. J. H. Maiden, however, has lately sent me flowering specimens of *A. rubida*, A. Cunn., gathered near Stanthorpe; and with these my barren specimens prove identical.

A. purpureapetala, *Bail.* Plant more or less hairy in all parts. Probably a small shrub, but collector gives no description of habit. Branches angular-striate. Stipules broadly lanceolate or triangular, about 1 line long, usually prominently recurved and then often split, and become hardened almost into spines. Phyllodia, without marginal gland, mostly under 1 in. long, and seldom exceeding 3 lines broad, 1-nerved and penniveined, the margins thickened, terminating in a very oblique prominent point formed by the marginal nerves and exserted point of the midrib. Peduncles solitary, shorter than phyllodia, slender, angular, bearing a narrow hairy bract above the middle. Flower-head purplish, scarcely exceeding a diameter of 3 lines. Flowers 10 or more in each head. Calyx-lobes short hairy. Petals lanceolate, glossy purple, free, bearing white hairs. Pod unknown.

Hab.: Herberton, *J. Stirling* (No. 214), 1904.

Order MYRTACEÆ.

LEPTOSPERMUM, Forst.

L. flavescens, var. citriodorum. Citron-scented Tea-tree. This shrub is noticed in my "Queensland Flora" under the var. *obovatum* of *L. flavescens,* but, as it differs considerably from all the varieties of this variable species, and may before long be known in commerce on account of the fragrant oil which can be obtained from its foliage, I have considered it advisable for the plant to be known as a distinct variety as given above, and in commerce the oil product as "Citron-scented Tea-tree Oil."

Distinctive Characters.—A shrub of dense growth, height a few feet, emitting a powerful citron-like odour. Branchlets more or less silky-hairy. Leaves thick, ovate to linear, 2 to 4 lines long, 1 or 3-nerved. Calyx-tube rugose, the base prominently ribbed, lobes broad, rounded, with pale almost membranous margin, the rest of the calyx of a bright brown. Petals large and more or less wavy, often purplish especially at the base, velvety. Filaments expanding at the base.

Hab.: Burrum River, *J. Keys*; Peel Island, *Wm. Soutter*. A quantity of the dried foliage of this plant has been distilled, and found to yield about 18 oz. of essential oil per cwt. Their fragrance is powerful, and strongly resembles the leaves of the citron-scented gum, and, should the oil prove of equal commercial value, this shrubby tea-tree could be more conveniently cultivated than the Eucalypt.

L. Petersoni, *Bail.*, n. sp. (After the collector.) Branches slender, and like the young growth at first silky but soon becoming glabrous. Leaves linear-lanceolate, seldom exceeding 1¼ in. long and 3 lines broad, point blunt, almost emarginate, midrib prominent with a parallel faint nerve between it and the margin on either side, the pinnate veins very oblique, distant, and obscure. Flowers axillary, solitary, sessile or nearly so. Bracts enclosing the flower-buds scarious, hairy outside, broadly cuneate, about 2 lines broad, but scarcely as long, 2-lobed. Calyx-tube about 2 lines long, glabrous, glossy, and wrinkled; lobes coloured, rotundate-ovate, about 1½ line broad, margins woolly-ciliate. Petals about 3 lines long including the broad flat claw, the lamina velvety and undulate. Stamens about 25 in a single row, not crowded. Ovary 5-celled.

Hab.: Wilson's Peak, *W. J. Peterson*, Jan., 1905.

Order UMBELLIFERÆ.

SIEBERA, Reichb.

S. Billardieri, *Benth.*, Fl. Austr. III., 356; **var. crassifolia,** *Benth.* Branches slender, clothed with short glandular hairs, usually more dense on the branchlets. Leaves somewhat crowded, sessile, ovate, 1 to 1½ lines long, the apex recurved and apiculate, upper surface tuberculose, underside rugose from raised lines. Inflorescence crowded at the ends of the branchlets, the peduncles slightly longer than the leaves; umbels bearing about 5 minute flowers. Fruit about 1 line broad, rather longer than broad.

Hab.: Peel Island, *Wm. Soutter*. Not previously known as a Queensland plant, before this var. *lanceolata* being the only representative of the species recorded for Queensland.

Order ORCHIDEÆ.

DENDROBIUM, Swartz.

D. Kingianum, *Bidw.*; **var. Aldersonæ.** Habit of the typical form. Flowers fragrant as in other forms, pure white except sometimes a very faint purple stain on the back of the sepals; and the labellum very faintly dotted with purple, the disk plates yellowish.

Hab.: Blackall Range, *Mrs. G. W. Alderson.*

Order SCITAMINEÆ.

ZINGIBER, Adans.

Z. Zerumbet, *Smith* Exot. Bot.; **forma australiana.** Rhizome thick, branching, the inside of a pale yellow. Leafy stems 2 to 3 ft. high; leaves numerous, oblong-lanceolate, 8 to 12 in. long and 2 to 3 in. broad, the sheath and both sides of the lamina more or less clothed with fine white hairs, shortly petiolate at base of lamina; ligula 6 to 12 lines long, broad and obtuse, margins thin-scarious. Peduncle 4 to 9 in. high; spike oblong, very dense, 3 to 4 in. long, diameter 1 to 1½ in. Bracts nearly orbicular, 1 to 1½ in. long, very obtuse green with a paler edge. Corolla-tube as long as the bracts; segments cream-coloured about 1 in. long, the upper broader; labellum of a palish-yellow, middle-lobe broadly oblong, emarginate about ¾ in. broad, basal lobes rather large, oblong. Stamen pale, as long as the lip; stylodia about 6 lines long, yellowish. Capsule not seen.

The species of which the Queensland plant is a form is widely spread over tropical countries, and, according to J. G. Baker, in Hooker's Flora of British India, VI., 247, includes *Z. spurium*, Kœnig., *Amomum Zerumbet*, Linn., *A. spurium*, Gmel., *A. sylvestre*, Poir., and *Zerumbet Zingiber*, Lestib. The plants now (Dec., 1904) flowering in my son's garden at Toowong are from roots which I dug up at Polo Creek, Somerset, in June, 1897, at which time the plants were in a dormant state, the stems lying flat upon the ground; and the present is the first time that they have shown flowers in cultivation.

While at Somerset in June, 1897, Mrs. F. L. Jardine recommended me to visit Polo Creek, it being described by her as a place to "delight the heart of a botanist," and such it proved to be; for, among other interesting plants, I met with the true *Seaforthia elegans*, R. Br., a rare palm, and *Hydriastele Douglasiana* and *Hoya Sana*, two new species which I named in honour of the late Hon. John Douglas and Mrs. F. L. Jardine, respectively.

Order COMMELYNACEÆ.

TRADESCANTIA, Linn.

Sepals distinct, concave, subequal, green or coloured. Petals distinct, obovate or orbicular, subequal. Stamens 6, often all perfect, subequal or the filaments alternately short and long, bearded, or naked. Anther-cells ellipsoid or oblong, longitudinally dehiscent. Ovary 3-celled; cells 2-ovulate. Capsule 3-angular, loculicidaly dehiscent. Flowers in umbels or rarely in panicles, often crowded, involucrate by leafy bracts, or pedunculate with small bracts.

T. fluminensis, *Vell.*, **var. tenella** (*C. B. Clarke*, in DC Mono. Phane. III., 294). Stems decumbent, rooting at the nodes, glabrous or pubescent, suberect. Leaves oblong or ovate-oblong, about 2 in. long, acute, sometimes slightly scabrous on the back; sheaths more or less hairy, especially at the throat. Flowers several, white in terminal umbels. Bracts broad-lanceolate, hairy or glabrous. Pedicels longer than the sepals. Sepals hairy or glabrous, about 2 lines long, cymbiform. Petals twice as large as the sepals. Filaments glabrous, inserted in a mass of transparent hairs; anthers yellow, cells ellipsoid. Ovary and style glabrous; stigma minute. This variety only differs in the filaments being hairless.

Hab.: Monte Video, South America. This plant, which often has variegated foliage, was introduced many years ago into our bush-houses on that account. It has of late overrun and become a weed in such places, and often loses the variegation. It has also established itself in damp spots on the roadsides.

Order GRAMINEÆ.

AGROSTIS, Linn.

A. alba, *Linn.*; sp. Pl. 63. A tufted perennial Stems varying from a few inches to 2 feet, sometimes decumbent at base. Leaves flat and sometimes short, smooth or rough; ligula short and truncate or long and acute. Panicle pyramidal or more or less elongate, contracted, and more or less dense, green, purplish, or brownish; branchlets roughish. Spikelets very numerous, outer glumes narrow, keeled, acute, about 1 line long. Flowering glume shorter,

broad, obtuse, or truncate, rolled round the flower, unawned. Palea very thin and hyaline, about half as long as the glume.

Hab.: Biggenden, *D. Macpherson*; more or less naturalised. A native of Europe, but now common in many countries.

Many writers consider *A. alba* and *A. vulgaris* to be only forms of one species. Those, however, who consider them as distinct, distinguish them as follows:—*Var. alba*: Ligula elongated, acute; panicle contracted after flowering. In America known as Fiorin Grass, White Bent, Creeping Bent, Marsh Bent, or White Top. *Var. vulgaris*: Ligula short and truncate; the panicle after flowering more or less spreading. In America known as Red Top or Herd's Grass, also Fine Bent and Fine Top.

Order FUNGI.

CERCOSPORA, Fries.

C. armoraciæ, *Sacc.;* Syll. Fung. Vol. IV., 433. Spots amphigenous; form various, broad pale. Hyphæ short simple, 30-40 x 5 μ, sooty; conidia rod-shaped, cuspidate 100—120 x 5 μ, pluriseptate, hyaline.

Hab.: On Horseradish (*Cochlearia armoracia*, Linn.) leaves, at Toowong. At the end of last summer and the early part of the winter, the leaves of all the plants were destroyed. As I had not noticed the fungus causing the injury before, I sent a sample to Mr. Geo. Massee, of Kew, England, from whom I received the following note:—

"The pale blotches on the horseradish leaves are caused by *Cercospora armoraciæ*, Sacc. If all diseased leaves are collected and burned, and the ground turned over, so that fallen spores are buried before new leaves appear, the injury will cease."

I find that where the above advice has only been partially carried out the fungus has put in a rather strong appearance again; so that persons wishing to cultivate this useful plant must not apply the remedy in a half-hearted manner, but destroy every diseased leaf as it appears.

WORLD'S PRODUCTION OF FINE COTTON.

The following diagram has been prepared for use in connection with addresses on cotton in the West Indies:—

Varieties.	Weight of Bales (pounds).	Range of Prices.	World's Production (bales).	Probable Production in W.I. in 1904-5 (bales 360 lb. each).	Probable Total Value (sterling).
Sea Island (S. Carolina)	360	13d. to 32d.	10,000	= 1,500	£30,000
Florida (S.I.)	420	12d. }	80,000	= 2,500	£50,000
Georgia (S.I.)	420	11d. }			
Egyptian (extra fine)	500	9d. to 10½d.	20,000	= 1,000	£20,000
Total			110,000	5,000	£100,000

—*Agricultural News*, Barbados.

THE HINTON-NAUDET PROCESS OF SUGAR MANUFACTURE.

All the cane turned into sugar at Madeira, W.I., in 1904, was manufactured by the Hinton-Naudet process, being an improvement on the Naudet process, and the results were remarkable. During the 1903 season all the juice or saccharine matter was extracted from the cane with a loss of 36 per cent. of the total sugar contained in the cane, and this juice was obtained in nine-tenths of its original density. This process has made quite a sensation in the sugar world, and during the 1904 season, which is just over, planters from Trinidad, Demerara, and Réunion came to Madeira to inspect it. I am informed that a large plant to treat 600 tons of cane per day is now being made in Glasgow for Trinidad. Should the advantages claimed for this process by the inventors be true—and I am told they have been demonstrated by practical experience—there is no doubt that it will revolutionise all over the world the manufacture of sugar from cane.—*Agricultural News*, Barbados.

Tropical Industries.

THE KOLA NUT *(STERCULIA ACUMINATA)*.

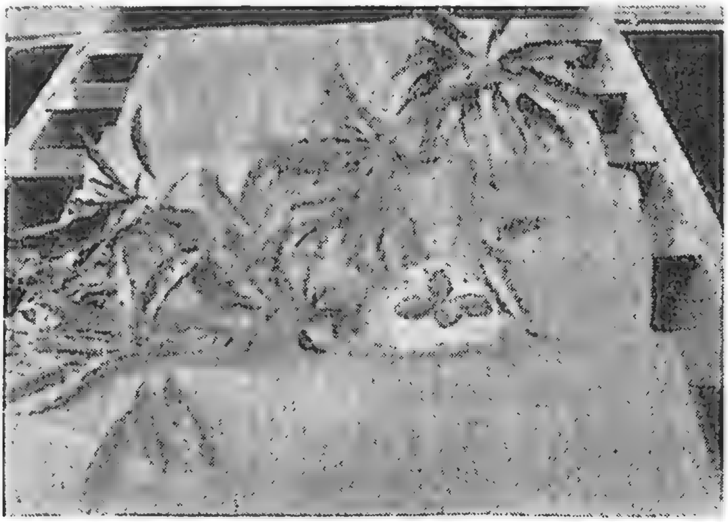
By H. NEWPORT, Manager, Kamerunga State Nursery.

The trees that bears the kola nuts of commerce belongs to the same botanic order as some of our indigenous bottle-trees—that is, the Sterculiaceæ, a name said to be derived from "Sterculius," a god, and on account of the bad smell of the flowers. The second name is descriptive of the shape of the leaves. While there are some fifteen genera of this order to be found in the State, some of

which (the bottle-trees) have economic values, as, for instance, the *S. diversifolia* (kurrajong), yielding a fibre, the seed of which plant is said to make a capital beverage when roasted and infused like coffee, yielding 1.8 per cent. of caffeine, none are so valuable as the *S. acuminata*, producing the kola nut of commerce. This trees is a native of the West Coast of Africa—the Gold Coast and Gambia—but is grown for commercial purposes in many parts of the tropical world; is sometimes spelt with a "C"—Cola—and is known in Jamaica as "Bissy," and in parts of Africa as the "Goora" nut, and both there and in the Central Soudan is a most important article of commerce.

The kola-tree is a small and somewhat thick-set tree, with dark-green leaves, each distinct, with a somewhat long stalk, and growing irregularly along the branches and in bunches at the ends. At first sight it is not unlike a small mango-tree. Some six distinct varieties are said to be recognised, the difference of which is mainly in the shape of the leaves and size of the tree.

In its native country it commences to bear in the fourth or fifth year, but does not come into fullest bearing until the tenth year. It then puts out bunches of waxy-looking, five-petalled flowers from the axils of the leaves and on the branches, white with a purple centre, and from 10 to 20 in a bunch. After reaching maturity, the tree is said in some places to flower almost continuously, so that blossom and ripe pods may be found on the tree together; in other localities it would seem to have two distinct crops in the year. On the setting of the blossom, small pods are formed, generally in groups of 3 to 5 on one stalk and radiating from a centre, the pointed and turned-up ends of which also add to the star-like shape of the bunch. These slowly swell, and attain some 4 to 6 inches in length, each pod containing 4 to 6 nuts, and as they ripen they turn brownish-yellow in colour, when they are not unlike a large chestnut. The capsule then splits, disclosing the seeds, which are generally of a light or brick-red colour, but may be any colour from red to pink or pure white. Pods have been known to contain as many as 15 seeds or nuts, or as few as 1, but the average is 4 to 6. When the pods or capsules open the crop is gathered, and one tree is said to yield as much as 120 lb. of marketable nuts annually. The nut, when freshly harvested, generally shows a line round it which is apparently sometimes slightly raised and sometimes depressed, and, on drying, the skin of the nut, which is soft and not hard like the shell of most nuts, will generally at this point show of a distinct colour, sometimes turning black and sometimes lighter than the rest of the nut. At these lines the nut may be divided or subdivided without damage to its market value. It was at one time supposed that the red and the white nuts came from distinct trees, and also that a bitter and a sweet variety existed, but it is now known that both red and white nuts are found on one tree and even in one pod, and considerable doubt has been thrown on the idea of a distinct bitter and sweet variety, as it was found that the nuts when dried often lost their bitter taste, but regained it on being steeped in liquid.



Curing.—In harvesting, the pods that have split are gathered as they are, and the seed or nuts taken out; those that have fallen to the ground being carefully collected, having in no way deteriorated in so doing. After gathering, the treatment would seem to differ according to the needs of the market. Where the market is sufficiently near, the sale is much better for nuts kept fresh. Sometimes the nuts are washed after having been collected and shelled, but when to be kept fresh this does not seem to be necessary or usual. In this case they must be kept moist, but yet kept from getting mildewed. They are then submitted to a short period of sweating or withering, and are packed in

baskets which are lined and covered with the green leaves of a tree, usually a tree called "Bal," each basket containing some 3,000 to 4,000 nuts, and weighing about 3 cwt. If the market is at any distance, the journey is commenced as soon as possible. Transport is frequently by pack animals, and the kola nuts, to be kept in good condition during transport, have to be repacked every now and then, when they are picked over, the mouldy or bruised and damaged ones removed, and the green leaves renewed in the baskets. It is said that in this manner, if kept moist, the nuts may be kept fresh for two or three years, and the nuts of Gandja, whether because of a different variety or from manner of growth or nature of climate is not known, lend themselves best to this mode of curing, if it may be so called. From the moist or fresh state they are sometimes made into paste for use, but do not keep for any length of time in this state.

In dry curing the washing process would seem to be more usual and advisable, although not essentially necessary. The main point is to dry uniformly and to avoid shrinkage and wrinkling, and for this reason the drying is done slowly, and largely in the shade. Here again the method adopted is indicated by the requirements of the particular market supplied. In some, the nuts are, towards the end of the process, dried in the open sun until brittle, and then are powdered; in others they are kept whole; and again in some places the nuts are split or broken into halves or sections. The better prices obtained on the London markets have been for the nuts so prepared. The driage amounts to from 60 to 75 per cent. of the weight, and the operation takes one to two weeks.

PRICE.—Where the local demand and market exist—that is, among the natives of Africa and other countries—and the nut is eaten or chewed while fresh, a price equivalent to from ½d. to 1d. each may be obtained. Wholesale the price is regulated by the quality, calculated by the number of the nuts rather than the weight. In London there is said to be a good market for the dried nuts at from 8d. to 1s. 4d. per lb.

(To be continued.)

OF INTEREST TO COFFEE-GROWERS IN NORTH QUEENSLAND.

By H. NEWPORT, Instructor in Tropical Agriculture.

COFFEE-PICKING.

With regard to the amount of coffee it is possible for a person to pick in a day, under conditions in which the estate picked has been kept, as is at the time of picking, clean and free from weeds, and the trees in good and full bearing, the following verbatim extract from a letter to the Instructor in Coffee Culture from one of the pickers themselves is of interest:—

"When you said to me I ought to see Turnbull's coffee, I didn't think I would get quite so well acquainted with it. I took the contract to pick it for him; we have not finished yet (22nd August, 1904). It seems it's going to be a lot over your estimate, which he tells me was 1¼ tons. He has already got 2 tons, and another ¼ to come anyway. On good picking we do 150 lb. a day easy. On his young coffee I picked 225 lb. in one day. I consider 90 lb. a small day's picking. Glad to hear there's a chance of a rise in price of coffee."

The estimate quoted was for clean coffee, and the picker's calculation is in dry parchment. The crop, however, off 2 acres amounted to about 18 cwt. of clean coffee per acre, of good quality, and worth about 8d. per lb. clean and graded at least. It was disposed of, however, by the owner in the parchment state, owing to absence of apparatus and machinery for hulling and grading, at 5½d. per lb., which roughly represents a gross return of some £46 per acre, from which the cost of harvesting has to be taken.

Hardiness of the Coffee Shrub.

A resident of the Daintree River district in North Queensland writes under date 5th December:—"It may interest you to learn the fate of my little experiment patch of coffee. A cyclone visited the Daintree on 10th March. Such was the force of the wind, accompanied by a perfect deluge of rain, that the scrub went down before it as before the axe. My coffee-trees were literally whipped to rags. Then down came the flood, running at 10 miles an hour, and submerged them to a depth of 20 feet. When the water subsided there was left an expanse of mud and *débris* of every description. Some of the coffee-trees were torn up by the roots, some broken off, all damaged and covered with mud. Still, when the renewed rain washed them they began to recover, and from the thirty trees remaining, although fully half the berries had been torn off by wind or water, I obtained a sackful of dried parchment—4 bushels. And now the surviving trees look splendid, a dark glossy green, covered with foliage and blossom, and laden with berries. This refers to *C. arabica*. *C. liberica*, though apparently the more robust trees, sickened and died, with one or two exceptions, and these I shall cut down and replace by the other variety. There can be no doubt, after such experience, the *C. arabica* is a wonderfully hardy shrub."

It may be mentioned that the blossoming this season is irregular. One blossom opened in October early, and instead of several blossomings following, as is usual, owing to unusually dry weather, none came until now, when the coffee generally in the North is spiking well, promising a better crop than was at first anticipated.

SISAL HEMP IN NEW SOUTH WALES.

The manager of the Wollongbar Experiment Farm writes to the *Agricultural Gazette* of New South Wales on the planting and returns of the *Agave rigida*, as follows:—

"Sisal hemp, he says, will grow in almost any soil, but a good loamy one is the best for it. A warm climate is essential. The fibre is easily extracted with machinery. At Wollongbar a Ramie decorticator machine is used, but more suitable appliances than that can be obtained in England. It takes from two to three years for the plants to mature, according to seasons. In the Richmond River district a harvest can generally be made in two years from planting the suckers. About 30 lb. of leaf are required to make 1 lb. fibre. Twenty leaves per plant is the best return obtained at this farm so far. A leaf will weigh from $2\frac{1}{2}$ lb. to 3 lb., so that the weight of leaf per plant will be approximately 50 lb. to 60 lb., representing from $1\frac{2}{3}$ lb. to 2 lb. fibre per plant. Allowing for waste in extracting fibre and grading, a fair amount might be put at $1\frac{1}{4}$ lb. fibre per plant. The best distance to plant, 5 feet, gives 1,742 plants per acre, so that the product per acre, represented by an all-round average of $1\frac{1}{2}$ lb. clean fibre per plant, will be, approximately, 1 ton 3 cwt. 1 qr. 9 lb."

Our own experience of the plant is that the plants should be set at least 9 feet apart each way. In Queensland the length of leaf is commonly 5 feet, and of some varieties 7 feet. When the leaf is ready to cut, it assumes a horizontal position. In such a case the leaves at 5 feet apart would reach from plant to plant, and even at 9 feet apart would overlap. Many leaves would be wounded by the overlapping, by being pierced by the spike, and a wounded leaf never recovers. The wound spreads, the part becomes yellow, then black and tough, and the fibre is destroyed. A common weight for Queensland leaves is 4 lb., and the yield in the third year about 32 lb. of leaf, and in the fourth year 60 lb. per plant. About 4 per cent. of this is fibre. Allowing 700 plants to the acre, and 2 lb. of fibre per plant, we have 1,400 lb. to the acre, and under ordinary circumstances 1 ton should be obtained, and under very favourable conditions 2 tons have been obtained. At present prices this would be worth £35; £14 will cover all expenses, leaving a profit of £21 per acre.

INOCULATING THE SOIL.

THE WORK OF NITROGEN-FIXING BACTERIA.

The following very interesting article on "Soil Inoculation," written by G. H. Grosvenor, in the "Century Magazine," we take from the *Tropical Agriculturist*, Ceylon.

Most people in this State have heard of the attempts to enrich the soil by means of nitrogen, but few know the reason for its failure, and fewer still of the brilliant success achieved in this direction by Dr. George T. Moore, who is in charge of the Laboratory of Plant Physiology of the Department of Agriculture of the United States of America. We give the full text of Mr. Grosvenor's account of this wonderful discovery, which is now attracting the attention of the whole civilised world. The marvellous cheapness of the fertiliser, costing the department only 2d. per packet for three packets sufficient to fertilise from 1 to 4 acres, is only equalled by its compactness and portability. The packages, containing sufficient of the fertiliser for an area of 6 or 7 acres, may be carried in the waistcoat pocket:—

"Did you vaccinate your land this year?" was the startling question I heard one farmer ask another the other day. "Well, I guess," he replied. "You remember that corner field which I gave up as hopeless last year? Well, when I heard about the yeast cakes the Government was giving free with the promise that they'd make clover or alfalfa grow where we farmers couldn't raise anything but weeds, and thin weeds at that, I thought I'd send for several of the cakes. When the cakes came I vaccinated the field according to instructions, planting it in alfalfa. I tell you I've had three whopping crops, and I've got off that formerly worthless field five times more than I've been getting off my best land, and I've got some pretty good land, too."

We have grown accustomed to the idea of being vaccinated. Some of our most dread diseases have been vanquished or checked by inoculation—smallpox, diphtheria, rabies, and, we hope, the plague—but to cure sterile ground and make it bring forth fruit in abundance by inoculation is something so strange and revolutionary that we should not believe the statement were it not for convincing and irrefutable facts.

Before explaining the discovery and manner of this extraordinary process of agricultural science, it might be well to review a few well-known facts in the life of plants.

Importance of Nitrogen.

One of the most important elements of the food of a plant is nitrogen, which it absorbs from the soil mainly through its roots; successive crops of grain soon drain the soil of its plant food, and in process of time make the richest land poor and worthless.

A good farmer partly balances the drain on his soil by using plentiful quantities of manure and fertiliser, and thus puts back much of the nitrogen which his crops remove.

We send to Chile, thousands of miles away, for help, and at much expense import from her thousands of tons of costly nitrate, though we have all about us—in the air we breathe—exhaustless stores of fertiliser. Free nitrogen forms seven-tenths of the atmosphere. If we could tap and use this sea of nitrogen, we could fertilise the whole earth and keep it rich; but it has been of no use to us hitherto because we have had no means of capturing it and of putting it into the ground. Its simplicity has baffled us. Like the plenty that tormented Tantalus, it has ever eluded our grasp.

A Nitrogen Famine.

We are taking the nitrogen from the soil so much faster than we can put it back that some persons have predicted a "nitrogen famine" at no distant date, and have luridly described the horrors that will fall upon us when the soil becomes so poverty-stricken that our crops of wheat and grain and rice will

fail to feed the nations. While this view is, of course, partly imaginative, and exaggerates the nearness of the danger, the fact remains that many areas in England and Europe and the eastern United States, formerly fertile, are now unproductive because the nitrogen in the soil has been exhausted.

But now man has captured a tiny germ invisible to the naked eye, which can take from the boundless store of nitrogen he has coveted, and put it into the earth for him.

Ever since the time of Pliny, farmers have noticed that, after a crop of peas, alfalfa, or any of the leguminous plants, a heavier yield of wheat can be obtained; thus has arisen the old profitable rule of rotation of crops.

But the reason certain plants enrich the ground while others exhaust it remained a mystery until an inquiring German discovered some years ago that peas, beans, &c., obtained their nitrogen food not from the nitrates in the soil, but from the free supply in the air. He also discovered that these plants absorbed much more nitrogen than they could use, and left the surplus in the soil—that is, beans, peas, alfalfa, clover put back into the mother earth what corn and wheat and grains remove. The manner in which they do this is unique, and another instance of the marvellous and mysterious laws by which the balance of nature is maintained.

THE BACTERIA NODULES.

If one digs up a healthy bean or clover plant and examines the roots, he will see a number of rounded bulbs, called nodules or tubercles, on the roots. At first sight he might imagine that the plant had a lot of sores over it, that it was diseased, or had been bitten by worms or insects. All legumes have these nodules or tubercles, varying in size from a pinhead to clusters as large as a good-sized potato. Scientists noticed that plants with good-sized nodules flourished, while plants without nodules or with very small ones looked starved and withered, and they concluded that the nodules must have something to do with the vigour of the plants. On dissecting a bulb and examining it under a microscope, it was found to be packed with bacteria. Further examination showed that it and all nodules consisted of millions of bacteria, and that these bacteria were incessantly absorbing free nitrogen from the air and converting it into forms suitable for the plant's digestion.

NITROGEN-FIXING BACTERIA.

For want of a better term, we will call the germs nitrogen-fixing bacteria.

Careful examination of the earth showed that all soils where legumes grow contain these nitrogen-fixing bacteria in greater or less quantities; that these organisms settle on the plants and form the colonies or tubercles on the roots. If the soil contains none of these organisms to settle on the roots, the legumes will not grow at all. Each tubercle acts as a feeder to the plant. The more numerous and larger the tubercles, the more prosperous is the plant. One might thus define a tubercle as a little factory where millions of tireless, infinitesimal workers are separating the nitrogen in the air and converting it into plant food. A celebrated German, Professor Nobbe, of Tharandt, realised that if he could put into barren ground some of these organisms, or if he could artificially present the seeds with power to develop tubercles of themselves, he could make legumes grow in the most hopeless soil.

THE FAILURE OF NITRAGIN.

After much labour, he isolated the nitrogen-fixing bacteria. He succeeded in breeding and colonising the germs, and then proceeded to put them on the market. He advertised them widely as able to make legumes grow in the poorest soil. Naturally the announcement made a great sensation, and farmers from all quarters of the globe wrote him for sample bacteria. He sold different preparations for different crops, putting them up in bottles and calling them *Nitragin*. But the bacteria did not work the miracles promised. Seeds

inoculated with them failed to develop tubercles. A few persons, to be sure, obtained wonderful results, but the vast majority of cases were complete failures. The bacteria burned themselves out and disappeared without producing a single nodule on the plants. They lacked permanence. The nitragin was withdrawn from the market.

These two men had done a great service to mankind: one had solved the problem of why certain plants enriched instead of drained the soil—he had isolated the microscopic agents, the myriads of organisms which carry back to mother earth what others had stolen; the other had shown that man could breed as many of these little helpers as he desired, but he had not been able to give them permanence, so that men could get service from them. At this point the inventive genius of an American, Dr. George T. Moore, came to the rescue, and saved the discovery by giving it just the practical value it had lacked. Dr. Moore is in charge of the Laboratory of Plant Physiology of the Department of Agriculture, and a widely known practical botanist. He had been watching Dr. Nobbe's experiments, and had come to the conclusion that Dr. Nobbe did not cultivate his nitrogen-fixing bacteria in the right way. The German's method of rearing his germ colonies resembled that of a rich father who gives his son everything he asks for without making the boy work for anything. As a result, when the youth is thrown on his own resources he proves unable to earn his own living, and collapses. Similarly, Dr. Nobbe, instead of developing the natural inclination and ability of his bacteria to hunt out nitrogen for themselves, dulled and destroyed this ability by giving them large quantities of nitrogen food, in what we might call predigested form; he so satiated them with nitrogen that they lost their ability to hunt for it themselves, and when turned out of the laboratory were helpless. They soon consumed the store of nitrogen which they had received, but could not by themselves get any more. Their nitrogen-fixing ability was gone, and they perished.

Dr. Moore decided not to dull the appetite of the nitrogen-fixing bacteria by giving them all the nitrogen they wanted; he thought he would whet their appetite—he would strengthen their nitrogen-fixing power, by exercise, by giving them in their food just enough nitrogen to make them want more and to make them strive to get more by their own efforts. By following this principle of feeding he developed a permanent type of bacteria in his laboratory, possessing five or ten times more power to fix free nitrogen than the original germs had possessed. The bacteria had gained strength, vigour, and self-reliance, and, when turned out of the laboratory, prospered like all healthy bacteria. Legumes inoculated with the bacteria developed great tubercles and grew to great size even in the poorest soil.

The nitrogen-fixing power of the bacteria developed by Dr. Moore is so extraordinary that seeds soaked in the solution will sprout and produce luxurious plants in quartz sand which has been previously ignited to a red heat in order to drive out all nitrates.

DISTRIBUTING MEDIUMS FOR THE BACTERIA.

Having secured a type of bacteria the nitrogen-fixing power of which was permanent, the next step was to obtain a simple means of distributing them to persons who desired to inoculate their land. Experiments showed that bacteria when grown upon nitrogen-free media will retain their high activity for a long time if carefully dried out and revived in a liquid medium. Dr. Moore also discovered that by using some absorbent, like cotton, a small piece of which will soak up millions of the organisms, and then by allowing these cultures to become dry, the bacteria can be sent to any part of the world and yet arrive in perfect condition.

Naturally Dr. Moore patented his discovery, but then he did a very unusual thing—he deeded the patent to the Department of Agriculture in trust for the American people. To be sure, his discovery had been made in the Government laboratories, but the Government, neither morally nor legally, could claim any share in the discovery. It was indisputably his. Dr. Moore gave the patent to the people, in order that all might have the free use of it. Doubtless he

could have made a generous fortune if he had formed a company and exploited the patent, as the German company made a good profit from their unreliable nitragin, which they sold at a dollar a bottle. A simple method of distributing the germs that bring fertility having thus been found, the announcement was made that the Department of Agriculture was prepared to send applicants free of charge enough inoculating material for several acres.

A portion of inoculating material as it is mailed to the farmer by the Government consists of three different packages. Package No. 2 contains the cotton with its millions of dried germs. Packages 1 and 3 are the media or food by means of which the farmer can multiply the germs. The department incloses explicit instructions how to use the bacteria as follows:—

Directions for Using Inoculating Material.

(Method patented in order to guarantee the privilege of use by the public. Letters Patent No. 755519, granted 22nd March, 1904.)

Put 1 gallon of clean water (preferably rainwater) in a clean tub or bucket, and add No. 1 of the enclosed package of salts (containing granulated sugar, potassium phosphate, and magnesium sulphate). Stir occasionally until all is dissolved.

Carefully open package No. 2 (containing bacteria) and drop the enclosed cotton into the solution. Cover the tub with a paper to protect from dust, and set aside in a warm place for 24 hours. Do not heat the solution or you will kill the bacteria—it should never be warmer than blood-heat.

After 24 hours add the contents of package No. 3 (containing ammonium phosphate). Within 20 hours more the solution will have a cloudy appearance, and is ready for use.

To Inoculate Seed.—Take just enough of the solution to thoroughly moisten the seed. Stir thoroughly so that all the seeds are touched by the solution. Spread out the seeds in a shady place until they are perfectly dry, and plant at the usual time just as you would untreated seed. The dry cultures as sent from the laboratory will keep for several months. Do not prepare the liquid culture more than two or three days previous to the time when the seeds are to be treated, as the solution once made up must usually be used at the end of 48 hours.

To Inoculate Soil.—Take enough dry earth so that the solution will merely moisten it. Mix thoroughly, so that all the particles of soil are moistened. Thoroughly mix this earth with four or five times as much, say half a wagon load. Spread this inoculated soil thinly and evenly over the field exactly as if spreading fertiliser. This should be done just before ploughing, or else the inoculated soil should be harrowed in immediately.

Either of the above methods may be used as may be most convenient.

Enough germs are sent in each little package to inoculate seeds for from 1 to 4 acres. The package can be carried in your pocket, and yet does more work than several cart loads of fertiliser. It costs the Government less than 4 cents a cake, or less than a cent an acre, and saves the farmer 30 or 40 dollars, which he would have to spend for an equal amount of fertiliser. Different cultures are sent for different crops.

Startling Results.

The results have been surprising. If Malthus were living, he would have to revise his calculation of the time when the world will be so crammed with people that it cannot feed them. The picture shows side by side two plots, one of which has been planted with inoculated and the other with uninoculated seeds. The growth on the first is rich and luxuriant, while the second is thin and scrawny.

Even more startling than this picture is a comparison of the actual figures of yield of two crops grown on exactly the same land, but one of inoculated and the other of uninoculated seeds. Two patches of hairy vetch, grown side by side under precisely the same conditions, yielded crops as follows:—Uninoculated patch, 581 lb.; inoculated patch, 4,501 lb.—an increase of more than

eight times. Crimson clover under similar conditions yielded:—Uninoculated, 372 lb.; inoculated, 6,292 lb.—an increase of nearly twenty times.

THE BACTERIA EASILY APPLIED.

It does not require a trained scientist to apply the cultures. The results obtained by any intelligent farmer are as wonderful as these.

This Maryland farmer had formerly been able to cultivate only one-third of his land; he had been obliged to abandon two-thirds because of the hopelessness of getting anything from it. Now, at no expense to himself and at trivial amount of labour, he had reclaimed the worthless two-thirds and made it more productive than the other third. He had increased the yield of his farm, his income, fivefold; a generous living is now before him.

And what did it cost the Government to help him so generously? Eight cents! The farmer had used two cakes to inoculate the seeds for 7 acres, each cake costing the Government 4 cents to manufacture.

But there are even other wonders that these little nitrogen-fixing bacteria work. It has already been explained how legumes enrich the soil by bringing back nitrogen to it. The same bacteria that increase the harvest of beans or clover or alfalfa tenfold enable the plants to leave many times more nitrogen in the soil than they would have done if uninoculated; in other words, they make the soil many times more fertile, so that the crop of cotton or wheat or corn or potatoes planted next year is many times larger. Thus the rotating crop the year following inoculation derives an equal benefit from the inoculation. For instance, a crop of crimson clover, not inoculated, added to 1 acre of land 4.3 lb. of nitrogen; a crop of crimson clover, inoculated, added to 1 acre of precisely similar land 143.7 lb. of nitrogen, an increase of 33½ times; a crop of inoculated hairy vetch added to 1 acre fifteen times more nitrogen than a crop of uninoculated hairy vetch.

Cotton planted after an inoculated crop of red clover gave an increased yield of 40 per cent. Potatoes, after an inoculated crop, yielded an increase of 50 per cent. The wheat crop increased by 46 per cent., the oats 300 per cent., and the rye 400 per cent. The table below shows the effect of inoculated legumes on various crops.

The germs can be used in any climate. It must be clearly understood, however, that only leguminous plants—beans, clover, alfalfa, peas, lupin vetch, &c.—are directly benefited by the nitrogen-fixing bacteria. Where the soil is rich in nitrates, the crop is not appreciably increased by the use of the inoculating bacteria; but where the soil is poor, the harvest is increased many times.

There is not a section of the United States which will not profit by Dr. Moore's discovery. Nearly every State has its worn-out farming land, bringing despair to the economist who laments our careless handling of the fields, and who wonders how the country will support the hundreds of millions soon to be ours. The bacteria means intensive cultivation with a vengeance, and should give him hope. It is impossible as yet to calculate by how much they will enhance the yield of our crops and of the world's crops, but the results already achieved prove that in time the gain will be enormous.

—	Original Yield per Acre.	Yield per Acre after Inoculated Crop.	Gain in Weight.	Gain in Value.	Per Cent. of Gain.
	Lb.		Lb.	$ c.	
Cotton	932	After red clover, 1,304 lb.	372	44·64	40
	Bushels.		Bushels.		
Potatoes	67 8	After crimson clover, 102·2 bushels	34·4	15	50
Oats	8·4	After velvet beans, 33·6 bushels	25·2	9	300
Rye	4 5	After peas, 23·5 bushels	19	9·85	400
Wheat	18·6	After melilotus, 26·9 bushels	8·3	6·50	46

WHERE APPLIED SCIENCE MAY ERR.

THE "COTTON ANT" AND THE BOLL WEEVIL.

An account was given in the August *Tropical Agriculturist*, Ceylon, of the scheme of the United States Department of Agriculture to introduce into the cotton-growing States the kelep or reddish-brown boll weevil ant from Guatemala. This ant is an active enemy to the weevil or snout-bearing beetle, *Anthonomus grandis;* and in Alta Vera Paz the cotton crops are able to resist the weevil's attacks because of the presence of the ant. That journal now writes:—

It is well known that the introduction of an animal or plant into a country or region where it is not indigenous may be attended with disastrous results.

THE BALANCE OF NATURE.

The perfect balance of natural forces existing in animal and vegetable life of any clearly defined geographical region at any time, which Charles Darwin made familiar to the world in his "Origin of Species," may be easily upset; and the consequences of disturbing this natural equilibrium cannot be foretold. As clear evidences of this we have the rabbit plague of Australia; the introduction of the English sparrow into America some fifty years ago; the blue "water hyacinth" in certain American rivers and in some Australian waters; and, to a certain extent, the introduced mongoose in Jamaica. Regarding the subject of this article, the Guatemala cotton ant, an American contemporary sounds a note of warning in this respect.

The suggestion, it says, that Guatemalan ants be imported into the Southern States and set at liberty to prey upon the boll weevil, of which they are a natural enemy, has prompted those who are familiar with the disastrous effects sometimes caused by the importation of plants and animals into new territory to raise four important questions, namely:—

First—What are the natural enemies of the Guatemalan ant?

Second—Do these enemies exist in the Southern States in sufficient numbers to prevent it from multiplying, spreading, and becoming as great a pest as the boll weevil?

Third—What are the habits and predilections of the ant tending to make it a nuisance in a new environment?

Fourth—What assurance have we that, if imported into the United States, the Guatemalan ant would confine itself strictly to the destruction of the boll weevil, and not, by destroying the "balance of power" among our fauna, injure the animate friends of man more than it would injure our enemies in that sphere of life?

These questions are generic in character—that is, with necessary changes they would apply equally well to any proposed importation of plant or animal which, after its introduction, might spread beyond control. It is evident that the Department of Agriculture needs to be exceedingly circumspect in acting upon suggestions of this character, and that its policy of selecting for its agents men of thorough scientific training, who can see all sides of such a question as this, is amply justified. Indeed, the experts in biology on guard at Washington and at the numerous quarantine stations have many times over saved the amounts of their salaries by preventing curiosity collectors from bringing back with them from foreign countries plants and animals which science has labelled as "dangerous."

That the Government experts are taking such precautions as have been indicated is only an added proof of the fact that American agriculture is on rising ground, rapidly approaching a stage of thoroughness in research and in the application for its results, and also of dignity and profit, such as the past has never shown us to be possible.

Our contemporary's fears regarding the kelep are, however, groundless; for Dr. Cook, in his investigations, has discovered that this ant has no noxious habits.

THE KELEP IN THE COTTON FIELD.

Cotton-growers in all parts of the world will watch with interest these efforts to check the ravages of the very destructive Mexican cotton boll weevil. The weevil (*Anthonomus grandis*) is closely allied to a familiar pest of English apple-trees, known as the apple blossom weevil (*Anthonomus pomorum*). The method adopted, not unknown in applied entomology, is to set one insect to attack another, and the destroyer in this case is an ant. The kelep, or Guatemalan cotton boll weevil ant, was discovered on cotton on 20th April last, in Alta Vera Paz, Guatemala; and its efficiency as a destroyer of the Mexican cotton boll weevil was demonstrated the next day. It was at once appreciated that this insect would be of value in the cotton plantations of Texas, provided it could be colonised and would thrive in that State, and that it had no noxious habit.

SOME ESTABLISHED FACTS.

The following three facts have already been established:—(1) The kelep attacks and kills the adult boll weevil, and thus holds this most injurious insect in check and permits the regular harvesting of a crop of cotton, even under conditions favourable to the weevil. (2) The kelep ant is carnivorous and predaceous; it injures no kind of vegetation, and takes nothing from the cotton plant except the nectar secreted on the leaves and floral envelopes. (3) The habits and temperament of the kelep are such that it is readily capable of domestication, transportation, and colonisation in the cotton fields of Texas. It has yet to be determined whether the keleps will survive the winter climate of Texas, and whether the ants can be obtained or propagated in sufficient numbers to serve the practical purposes for which they have been introduced. Though the kelep will attack other insects than the boll weevil, it spares the larvæ of ladybirds, which are themselves beneficial insects. These larvæ are often picked up by keleps, but are put down again without injury.

SALINE IRRIGATION IN HAWAII.

Director C. F. Eckart, of the Hawaiian Sugar Experiment Station, has been recently experimenting (says the *Louisiana Planter*) with saline irrigation, and brought about some novel results, which he has recently published in Bulletin No. 11. The use of salt water for irrigation was found to be far inferior in its effectiveness to fresh water as an irrigating medium, but still it was found that the cane grew better than was expected with this saline irrigation. For the purpose of experimenting, water containing 200 grains of salt per gallon was used, and at the same time experiments were made with lime fertilisers, and it was found that the lime of the soil and that introduced as a fertiliser were displaced to some extent by the sodium of the salt water, forming a lime chlorid in the soil, which was less injurious than the salt water.

The experiments are valuable in degree as showing that salt water is not an unmitigated evil. It was found, however, in the experiments that only about one-fifth as much sugar per acre was secured with salt-water irrigation as with fresh-water irrigation, and that salt-water irrigation with lime, as compared with salt-water irrigation without lime, gave a proportion of sugar of about 4 to 3, or an increase of one-third sugar on account of the introduction of lime.

Science.

GREEN MANURING.

By J. C. BRÜNNICH, Chemist to the Department of Agriculture.

The practice of sowing a rank and rapidly growing crop, which when near maturity is ploughed or dug into the ground, is called "green manuring."

Green manuring has already been practised by the ancient Romans, who generally ploughed in their second or third crops of lucerne, a custom which is still being done at the present day in Italy. It will surprise our readers to learn that in Southern Italy, particularly in Sicily, prickly pear *(Opuntia ficus indica)* is largely used as a green manure, and is considered a first-class collector of nitrogen and potash and producer or humus. Rows of prickly pear are planted between vineyards and orchards, to be cut down for green manuring, and land to be prepared for a vineyard or orchard is left for several years under prickly pear.*

In other parts of Europe, lupins, vetches, mustard, rape, buckwheat, and other plants are used for green manuring; in the United States, Indian corn or maize, clover, and more especially cowpeas are used for the same purpose.

The principle on which green manuring is based may be shortly expressed by an old sentence used by Rückert: "Everything which enters into the composition of a plant will also help its growth."

The chief advantages of green manuring are: An increase of vegetable matter in the soil and production of humus, improvement in the mechanical condition of the soil, increase of available plant foods, which, if green crops are deep-rooters, are drawn from a greater depth and wider area, and, finally, a collection of nitrogenous matter from the atmosphere if the green manure belongs to the family of legumes.

The production of humus is a very important factor of the advantages of green manuring, and, in order to appreciate and understand it properly, let us consider what humus really is, and what part it plays in the economy of nature.

Humus is a dark-brown or black substance produced in the soil by the decay of vegetable matters in the presence of moisture and a limited supply of air. Humus is not a definite chemical compound of unvariable composition, but is a mixture of a great number of decomposition products, some of which are definite chemical substances, and most of which may undergo further changes and decomposition. These products, which are nearly all dark-coloured, have peculiar physical properties, and impart to the soil very important properties. Soil containing humus has the properties of absorbing more heat from the sun, greater power for absorbing and retaining moisture; humus, furthermore, has the property of loosening and opening the soil. The chemical properties of humus are of equal importance to the physical properties already enumerated, and may be summarised as follows:—The humus by its continual decomposition produces carbonic acid, which acts on the mineral matters in the soil, and changes them into more soluble and available forms. Other acids are produced which also assist in the decomposition of soil and liberate and fix plant foods.

Too much humus, however, may become detrimental to our ordinary crops, particularly if the soil is deficient in lime, which chemical compound would help to neutralise any surplus of acid. A production of humus on a large scale takes place in the formation of peat or turf bogs, in which vegetable matter decays under water, with a diminished supply of air and at a fairly low temperature. Boussingault has made valuable observations with regard to change of vegetable matters into humus and peat, and has shown that heat prevents and diminishes the formation of peat. These observations are of the greatest

* "Tropenpflanzer," Feb., 1901, p. 67.

importance to us, and explain why so many of our soils are really deficient in humus. Under the influence of our subtropical and tropical climate, the sun baking the soil with nearly the same energy the whole year round, the irregular supply of moisture, the formation of humus is often prevented or at least hindered, particularly in open forest land.

A large number of our soils are, moreover, deficient in lime, and this causes acidity of the soil. As a rule, acid soils are always poor in nitrogen. A heavy crop of green manure ploughed under in such a soil would only cause troubles, and an application of lime, best in the form of air-slacked lime, directly after the ploughing in, would be the only remedy. A long delay between the ploughing under of the green manure and sowing or planting of the crop which is to follow is also to be avoided if a good humus is to be formed, in order that the following crop may derive the fullest benefits. The shelter which the green manure crop affords to the soil during its growth is also of importance, and, considering that our soils do never get a proper rest, either summer or winter, such shading is of still greater value, as the soil is kept open and mellow, and formation of hard crusts by heavy rains are prevented: rain water again is collected on the ground, instead of running off the bare land. Weeds are also kept down by green manure crops.

The proper time for the ploughing in of a green crop is when the plants are in full flower and the seeds are just beginning to form. The quantity of material collected by green crops can be seen from the following table, and are calculated from analyses made by myself from crops grown in different parts of the State:—

AMOUNTS OF PLANT FOODS COLLECTED BY GREEN MANURES, IN LB. PER ACRE.

Name.	Grown at—	Organic Matter.	Nitrogen.	Potash.	Phosphoric Acid.	Remarks.
Cowpea	Homebush, Mackay ...	6,440	151	96	35	*Crops from 8 to 10 weeks old
White Mustard	,, ,, ...	2,310	40	67	16	
Sorghum	,, ,, ...	7,610	54	61	63	
Maize	,, ,, ...	10,850	72	62	30	
Tonga Bean, Lablab ...	Biggenden State Farm ...	9,357	276	...	...	Potash and phosphoric acid not determined
Poor Man's Bean	,, ,, ,, ...	6,498	173	...	...	
Sorghum, Planters' Friend	Botanic Gardens, Brisbane	1,900	50	67	60	Grown on poor sandy soil; no manure
,, Early Amber ...	,, ,, ,,	2,300	60	71	65	
Maize	,, ,, ,,	2,581	51	46	29	10 weeks' crop
Soja Bean	Mackay Experiment Farm	2,868	85	40	13	†Weight of roots included in these crops
White Lupins	,, ,, ,,	8,765	303	166	32	
Cowpea	,, ,, ,,	5,462	216	123	61	
Winter Tares	,, ,, ,,	8,068	298	162	24	
Velvet Bean	,, ,, ,,	8,012	272	97	51	
Rape	,, ,, ,,	6,423	276	255	40	
White Mustard	,, ,, ,,	9,690	355	374	45	
Lucerne	Agricultural College, Gatton	3,007	102	108	18	A second cut of about 4 weeks' growth

* *Sugar Journal*, August, 1902, page 148, and *New South Wales Agricultural Gazette*, November, 1902, page 928.
† Annual Report Bureau Sugar Experiment Station, 1902-3, page 22.

In order to fully appreciate the amount of plant foods collected, for instance, by cowpeas, the crop first on the list, I must mention the remarks made by Mr. E. Knox, the general manager of the Colonial Sugar Refining Company, in his letter addressed to the cane-growers on the Clarence River:*—"The whole expenses in connection with the planting and cultivation of this crop of cowpeas amounted to 19s. 6d. per acre, while the manure obtained in the shape of nitrogen, potash, and phosphoric acid would have cost about £6 had it been purchased in the form of chemical manures, the good done to the soil by the addition of organic matters and by the spreading of the roots and the decomposition of these being left out of consideration."

If we compare with this crop the crop of cowpeas grown at the Mackay Experiment Station, we find that the manurial value of the latter is considerably higher. Of course we must not overlook that these plant foods are, with

* *Sugar Journal*, Aug., 1892, p. 148.

the exception of the bulk of the organic matter and part of the nitrogen, taken from the soil, and thus do not correspond to an actual addition of chemical manures. In studying the amounts of plant foods collected by the various plants, we see that in all cases of crops belonging to the family of "legumes," to which cowpea, vetches, beans belong, that the amount of nitrogen is very much higher than the amount of potash, which is accounted for by the fact that all the plants belonging to this family are able to collect nearly all the nitrogen they contain from the atmosphere with the help of microscopically small organisms or bacteria found in the wood nodules of these plants. This peculiar process of mutual help or parternership between the lower organism of bacteria and the higher plant life is called "symbiosis," and we must be clear to understand that in this process the bacteria collect the nitrogen from the air with the help of higher plants on which they live. The tubercles or nodules are not formed on leguminous plants grown on sterilised soil, and the plants will not thrive and soon die off. If sterilised soil is inoculated with cultures of bacteria obtained from healthy nodules, the plants will thrive, and a large number of nodules will be formed. In similar manner the bacteria will not exist for any length of time without the help of leguminous plants, and it is quite possible that soils may become very deficient in these nitrogen-producing bacteria, and, consequently, leguminous crops would give only poor results, which would be improved by supplying to the soil these bacteria in the form of pure culture commercially obtainable under the name of "nitragin." The whole decomposition of the organic matters in the soil is the work of bacteria, and we find, consequently, a very large number of such organisms in any normal soil. J. Hohl* estimates the number of bacteria in 1 gramme of moist soil as between 3,000,000 and 50,000,000, or from 195,000 to 3,250,000 per grain. Although the number seems large, they are not crowded, as 1 grain could contain 39,000,000,000. Amongst these bacteria we find always such which decompose and putrify organic matter and also cellulose the woody portion of the plant, and generally others which produce nitrogen, change ammonia salt into the more valuable nitrates (of which ordinary saltpetre is the representative), and others again which destroy nitrates and form nitrogen which is lost to plant life. Among the bacteria-producing nitrogen we have already mentioned those which only produce it with the help of leguminous plants, but others have been discovered recently which produce nitrogen by themselves. In 1901, Beijerink† describes such microbes, one of which, *Azotobacter chroococcum*, has since then been found, cultivated, and experimented with by several scientists, as Gerlach, Vogel, Freudenreich, and others. Gerlach and Vogel‡ not only proved that this organism produces nitrogen in a nitrogen-free medium, but that inoculation of soil in which white mustard was grown gave a very considerable increase of this crop. This fact may help to explain the exceptional good yield of the white mustard crop grown at the Mackay Experiment Station, which the great amount of nitrogen produced. The presence of lime in the form as lime carbonate always increases the activity of these bacteria.

The results show that any quick-growing crop may be used for green manuring, and that certain crops may be more suitable for a given district; this would have to be found out by experiment. Most classes of soils will be benefited by green manuring, but more particularly heavy clayey soils, which thereby are opened out. Trouble may be caused if applied to very light sandy soils followed by a dry season, which would prevent proper decay of the green crop and leave the land in a bad condition. As already stated, souring of the soil must be avoided, and can be remedied by application of lime, which so many of our soils need in any case. Green manuring will always be of particular value in cases where no rotation of crop can be practised, the same crop being grown for years in succession, as, for instance, in orchards.

* Jahrbuch der Schweiz, 9, 1904, p. 435.

† Zentralblatt für Bacteorologie, Bd. VII., p. 561.

‡ Zentralblatt für Bacteorologie, Bd. VIII., p. 669, and Bd. IX., p. 817.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1904.											
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
North.												
Bowen	3·45	2·65	1·12	0·31	0·25	0·30	Nil	Nil	Nil	1·66	0·16	4·33
Cairns	10·03	10·55	15·73	13·33	3·21	Nil	0·35	0·62	0·12	0·37	0·42	7·88
Geraldton	24·37	14·04	31·09	38·73	11·81	0·39	1·78	3·99	0·76	2·49	1·18	7·35
Herberton	8·01	5·16	18·25	7·08	1·55	Nil	Nil	0·59	0·44	0·62	1·15	2·06
Hughenden	2·71	2·80	1·93	1·36	0·07	0·44	Nil	Nil	0·22	4·10	1·76	0·28
Kamerunga	7·37	9·39	22·35	15·48	3·50	Nil	0·42	1·05	0·27	1·00	0·43	11·62
Longreach	1·77	2·69	1·01	0·31	2·78	0·04	Nil	Nil	Nil	4·66	0·72	1·34
Lucinda	11·71	8·40	22·40	11·30	4·00	Nil	0·45	Nil	2·00	1·90	0·50	2·10
Mackay	16·74	3·17	5·69	5·24	3·61	0·93	0·12	0·04	8·14	8·07	Nil	1·52
Rockhampton	5·12	3·50	5·11	13·82	0·77	1·26	0·03	Nil	0·22	1·36	1·32	1·60
Townsville	5·48	5·19	4·01	1·03	0·24	0·04	Nil	Nil	0·04	3·67	1·17	5·70
South.												
Barcaldine	3·26	0·96	0·11	1·19	3·85	0·16	Nil	Nil	0·20	3·88	1·02	6·54
Beenleigh	2·81	1·25	8·08	14·99	6·17	0·15	1·54	0·25	2·11	1·89	4·43	4·55
Biggenden	7·48	0·71	3·16	2·92	2·29	0·71	0·29	0·29	Nil	4·06	1·08	5·89
Blackall	2·28	3·67	0·39	3·76	3·08	0·32	0·12	0·14	Nil	4·99	0·53	5·04
Brisbane	2·65	0·77	7·07	7·23	4·04	0·59	1·48	0·53	1·59	1·28	2·36	3·65
Bundaberg	3·18	0·85	4·26	5·64	1·32	0·86	0·51	0·62	0·48	3·32	0·16	5·16
Caboolture	4·29	1·32	8·48	9·90	4·66	0·17	2·12	0·30	1·53	2·42	3·07	7·36
Charleville	1·87	2·56	4·60	3·62	3·07	0·31	0·52	0·15	0·40	3·14	0·09	2·51
Dalby	1·88	3·20	4·74	0·40	4·69	0·34	2·63	0·24	3·01	1·7	2·59	2·15
Emerald	2·70	1·26	4·14	5·88	1·23	0·96	0·06	0·09	0·06	1·44	2·43	2·44
Esk	2·37	1·86	3·18	4·91	3·99	0·20	2·43	0·33	3·10	2·90	2·90	3·07
Gatton College ...	2·15	1·20	4·17	2·59	3·79	0·45	2·12	0·07	1·09	1·95	1·14	2·42
Gayndah	7·01	1·83	2·97	1·63	1·61	0·93	0·99	0·41	0·27	2·49	0·67	2·36
Gindie	1·52	1·40	1·83	4·81	1·65	0·43	Nil	0·21	0·02	3·09	1·55	2·02
Goondiwindi	2·90	2·65	7·32	0·37	3·40	0·49	2·62	0·67	1·64	1·69	1·61	1·62
Gympie	9·27	1·89	3·32	10·86	4·11	0·60	1·11	0·47	0·84	4·08	2·55	3·94
Ipswich	4·07	1·72	3·55	4·71	3·50	0·23	1·75	0·05	1·56	3·20	1·62	4·25
Laidley	2·93	1·35	5·36	2·83	3·12	0·32	1·68	Nil	1·87	1·87	3·99	5·26
Maryborough	2·64	0·56	3·94	10·07	4·42	1·37	0·39	0·16	0·62	3·52	2·62	2·33
Nambour	6·39	1·91	10·30	15·43	6·94	0·32	1·78	0·59	0·43	1·62	2·08	7·54
Nerang	3·89	0·85	11·18	13·83	7·52	0·19	1·12	1·22	2·21	3·52	2·39	3·85
Roma	1·85	0·59	2·32	5·06	3·73	0·20	0·84	0·70	1·22	1·43	0·03	1·76
Stanthorpe	2·29	1·33	6·57	0·71	4·11	0·63	2·64	0·34	1·85	3·98	1·92	5·00
Tambo	2·48	1·72	1·26	5·46	3·96	0·28	0·61	0·22	Nil	3·31	0·89	3·90
Taroom	1·39	2·79	1·58	2·21	3·49	0·54	0·59	0·82	0·05	2·42	1·73	2·92
Tewantin	3·03	2·59	19·55	30·39	9·29	0·21	1·11	2·20	0·50	1·09	1·93	7·61
Texas	1·70	3·67	5·72	0·03	2·99	0·70	2·12	0·48	0·81	1·63	0·76	2·97
Toowoomba	4·26	3·98	4·76	3·29	4·08	0·38	2·58	0·02	2·24	1·61	2·26	2·75
Warwick	0·60	2·91	5·74	0·66	2·85	0·53	1·98	0·19	2·76	2·89	1·92	3·65
Westbrook	1·46	2·82	3·49	9·00	3·18	0·22	2·24	0·14	2·29	4·85	3·37	3·65

* One day gauge overflowed.

EDGAR L. FOWLES,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Danish, 116s.; Victorian, 98s. to 106s.; New South Wales, 98s. to 106s.; Queensland, 96s. to 98s.; South Australian, 96s. to 98s.; New Zealand, 98s. to 106s. per cwt.

CHEESE.—Canadian, 49s. to 50s.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £22 to £24; raw, £14 to £17 per ton; German beet, 88 per cent., 14s. 0¾d. per cwt.

MOLASSES (duty, 2s. per cwt. and ¼ per cent.).—4s. to 9s. per cwt.

RICE.—Rangoon, £8 15s. to £13; Japan, £13 to £18; Java, £19 to £24; Patna, £17 to £19 per ton.

Coffee (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 41s. to 105s.; peaberry, 60s. to 120s.; Santos, 36s. to 57s.; Mocha, 56s. to 90s.; Jamaica, 105s. to 125s. per cwt.

Chicory Root (duty paid).—24s. to 25s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 33s. 4d. to 33s. 6d. per 448 lb.; English, 30s. 2d. to 33s. 6d. per 504 lb.; Australian, 32s. to 33s. 6d. per 480 lb. = 3s. 4d. to 4s. 2d. per bushel.

Flour.—Australian, 25s. 6d. per 280 lb.

Malting Barley.—Australian, 30s. to 32s. per 448 lb.; grinding, 36s. to 40s. per 416 lb.

Oats.—New Zealand, 14s. 6d. per 320 lb.; Algerian, 14s. 6d. per 384 lb.

Split Peas.—37s. to 47s. per 504 lb.

Ginger.—Jamaica, 45s. to 55s.; Cochin, 50s. to 55s.; Japan, 16s. to 17s. per cwt.

Vanilla.—3s. to 7s. per lb.

Pepper.—Capsicums, 14s. to 60s.; chillies, 45s. to 50s. per cwt.; black, 4⅞d. to 5¼d.; white, 7¼d. to 7½d. per lb.

Green Fruit.—Apples: Baldwins, 12s. to 14s. per case; Canadian, 12s. to 18s. per case; bananas, 8s. to 12s. per bunch; pineapples, 2s. 9d. to 5s. each; oranges, 10s. to 21s. per 420.

Dates.—Tafilat, 85s. to 92s.; Egyptian, 30s. to 32s. per cwt.; Persian, 8s. 9d. to 11s. 6d. per case.

Cotton.—Uplands (nominal), 5d. to 7d.; Sea Island, 1s. 2d. to 1s. 4d. per lb.

Cotton Seed.—£6 17s. 6d. to £7 per ton.

Cotton-seed Oil.—Crude, £15 15s.; refined, £16 10s. to £18 per ton.

Cotton-seed Oil Cake.—£6 17s. to £7 per ton (decorticated); £4 12s. 6d. to £4 15s. (undecorticated).

Cotton Waste.—24s. to 34s.; discoloured, 18s. to 25s. per cwt.

Linseed.—33s. 6d. per quarter.

Linseed Oil.—£15 to £15 5s. per tun (252 gallons).

Linseed Oil Cake.—£6 17s. 6d. to £8 5s. per ton.

Olive Oil.—£50 to £55 per tun (252 gallons).

Copra (cocoanut-kernel).—£17 10s. to £17 17s. 6d. per ton; £8 to £10 per ton at the S. S. Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

Cocoanut Oil.—£30 to £34 per ton.

Beeswax.—Australian, £7 5s. to £7 10s. per cwt.

Honey.—Jamaica, in original 3-cwt. casks, 2d. to 4d. per lb.; in tins, 14 lb., 28 lb., or 56 lb., 2½d. to 4½d. per lb.; repacked and graded in glass vases, from 6s. to 7s. 6d. per dozen 1-lb. vases; 3-lb. glasses, from 12s. to 15s. per dozen; 40 cases "very ordinary" Queensland were sold at 16s. per cwt.; 60 cases common New Zealand at 17s. 6d. per cwt.

Lucerne Seed.—60s. to 65s. per cwt.

Canary Seed.—72s. to 95s. per quarter of 480 lb. = 8s. 9d. to 11s. 10½d. per bushel.

Manilla Hemp.—£30 to £35 per ton.

Sisal Hemp.—£35 to £38 per ton.

New Zealand Hemp.—£32 5s. per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—1d. to 2d. per lb.; pearl, 10s. to 13s. per cwt.

Eggs.—French, 17s. 6d. to 18s.; Danish, 12s. to 17s. per 120.

Bacon.—Irish, 46s. to 52s.; American, 40s. to 42s.; Canadian, 48s. to 50s. per cwt.

Hams.—Irish, 76s. to 108s.; American, 47s. to 52s. per cwt.

Tallow.—Mutton, fine, 30s. to 30s. 3d.; medium, 26s. to 27s.; beef, fine, 27s. to 27s. 3d.; medium, 25s. 9d. to 26s. per cwt.

GOATSKINS.—Cape, from extra light to heavy, 9d. to 13½d.; Angora, light to heavy, 5d. to 7½d.; Natal, goat and Angora, 1¾d. to 8d. per lb.

POULTRY (Smithfield).—Large supplies, but trade all round ruled slow. Quotations:—Fowls (each): Yorkshire, 2s. 9d. to 3s.; Essex, 2s. 9d. to 3s. 3d.; Boston, 2s. 3d. to 2s. 9d.; Surrey, 3s. 6d. to 4s.; Sussex, 3s. to 3s. 6d.; Welsh, 2s. 3d. to 2s. 9d.; Irish, 1s. 9d. to 2s.; geese, 4s. to 5s.; country ducks, 2s. 9d. to 3s. 3d.; turkey—cock, 8s. 6d. to 12s.; hen, 4s. 6d. to 5s. 6d.; Australian rabbits, 6s. 6d. to 8s. 6d. per dozen; hares, 2s. 3d. to 2s. 9d.; leverets, 1s. 6d.:

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	Jan. 14.	Jan. 21.
New Zealand Sheep. (Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	$4\frac{3}{4}$d.	$4\frac{5}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{5}{8}$d.	$4\frac{1}{2}$d.
Canterbury, heavy (64 lb. to 72 lb.)	$4\frac{1}{2}$d.	$4\frac{3}{8}$d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	$4\frac{3}{8}$d.
North Island (56 lb. to 65 lb.), ordinary	$4\frac{1}{2}$d.	$4\frac{1}{4}$d.
North Island, best	$4\frac{5}{8}$d.	$4\frac{7}{16}$d.
Australian Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{7}{16}$d.	$3\frac{1}{4}$d.
Light (under 50 lb.)	$3\frac{5}{8}$d.	$3\frac{1}{2}$d.
River Plate Sheep. (Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{11}{16}$d.	$3\frac{5}{8}$d.
Light (under 50 lb.)	$3\frac{7}{8}$d.	$3\frac{11}{16}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	None offering.	
Canterbury, heavy (36 lb. to 42 lb.)	None offering.	
Dunedin and Southland (28 lb. to 42 lb.)	None offering.	
North Island (28 lb. to 42 lb.) ...	None offering.	
Australian Lambs.		
30 lb. to 40 lb., first quality ...	$5\frac{1}{4}$d.	$5\frac{1}{8}$d.
30 lb. to 40 lb., second quality ...	$4\frac{3}{4}$d.	$4\frac{5}{8}$d.
River Plate Lambs.		
30 lb. to 40 lb.	None offering.	
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	3d.	3d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{7}{16}$d.	$3\frac{7}{16}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	$2\frac{5}{8}$d.	$2\frac{5}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	3d.	3d.
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{5}{8}$d.	$2\frac{5}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	3d.	3d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

SISAL HEMP.

In 1903 the United States of America imported raw sisal hemp to the value of 40,000,000 dollars, or £8,000,000 sterling, and this was only a portion of their importations of hemp. At a meeting of the Louisiana Sugar Planters' Association in October, 1904, a Mr. Lafout, partner of the late Mons. Faure, the inventor of the first cane shredder, and of the ramie decorticating machine, exhibited a machine for cleaning sisal leaves, which has only been lately perfected. He stated that it would turn out from 1,200 to 1,300 lb. of clean fibre in a day's work. The yield of fibre averages about 5 per cent. of the weight of leaf, but often ranges as high as 6¾ and 7 per cent.

KILLING JOHNSON GRASS.

The *Louisiana Planter*, quoting a telegram in the *Houston Post*, which stated that on the Grayson county farm at Sherman, Texas, the superintendent had entirely eradicated Johnson grass, covering 15 acres, by means of an inexpensive copyrighted mixture, expressed the opinion that any mixture which would destroy Johnson grass, root and branch, would destroy all other kinds of vegetable life. The editor of the *Louisiana Planter* accordingly wrote to the superintendent of the Texas county farm, who replied as follows:—

" . . . . In February I broke 15 acres of very rich land on the Grayson county farm. This land was thoroughly set in Johnson grass, and had ben cut for hay for several years. The land was ploughed 5 to 6 inches deep, and was then harrowed. Nothing further was done until 18th May. The young grass was then 12 to 18 and 20 inches high.

At the stage of growth for killing, the land was rebroke with a sulky and also a walking plough, a 5 and 15 gallon keg were securely fastened and a sprayer attached. Next, 2 gallons of a secret fluid was put into a 40-gallon barrel of clean water, and the land was sprayed as ploughed in the bottom of each furrow. The above 40 gallons of mixture is sufficient for 1 acre, and costs 2 dollars. The land can then be planted in cotton, and the cultivation will keep down the young grass that will keep coming from the seed.

I planted in cotton, but the wet weather that followed rotted the seed. I have simply double disked with a pulveriser the land once each month to the present time, and have as clean a piece of land as any one ever saw. This mixture does not injure the land; the roots below were ploughed sour, turn brown, then turn white. A gas also forms that kills the roots that are in the turned over land, and all is evaporated within four days.

At the test we had on the farm, 16th August, representatives of the Press, local and from Denison, were present, and many others. The pick and shovel were freely used, and the old roots were found dead and entirely rotten, while on the land on each side of this experiment plot the grass was from 20 inches to 4 feet high. Mr. S. Y. Trice, Dallas, Tex., prepares the secret part of this remedy, and sends it out. He guarantees that where instructions are followed all grass, from seed and all, will be killed by August, and I fully concur in the same. I have resided twenty-six years in this county, and have never seen this pest completely subdued before, and will say to all that if instructions are followed, and they are easy, you will not be troubled with Johnson grass if this treatment is used.

J. E. SAMMON,
Superintendent, Grayson County Farm, Sherman, Texas."

[If this secret mixture will thus destroy Johnson grass, without injuring the soil or the succeeding crop, it is possible that it would act in like manner on nut grass.—Ed. *Q.A.J.*]

THE MUTTON SUPPLY OF ENGLAND.

Taking the aggregate declared value of the live sheep and mutton imports for the completed period of the year 1904, we find this amounts to £7,462,908. It is a remarkable fact, and one of great significance, that, despite this large amount paid away for imported mutton, one of the most paying sources of British farm revenue is sheep on farms, which are suitable for their maintenance.

This fact should emphasise the advisability of Queensland farmers raising sheep and lambs for local trade and for export.

SUGAR FROM COTTON STALKS.

Cotton, which has been the South's most steadfast friend alike in times of trouble and serenity, has developed another and hitherto unsuspected value. If the result of an analysis recently made by a Philadelphia chemist is reliable, the cotton stalk, which has previously been regarded as useful only as a fertiliser, will rise to the dignity of greatly augmenting the South's aggregate income. It is claimed for the stalk that, carefully treated, it yields between 2 dollars and 4 dollars' worth of sugar to the ton. Nor is this the sum of its usefulness. The waste resultant from the sugar-refining process can be manipulated to produce a grade of paper much superior to that obtained from wood pulp. The stalks were also found to contain a material resembling celluloid, the base for a smokeless powder composition, and a fair grade of alcohol. That the evolution has been taken seriously is evidenced by the fact that a corporation is about to begin the construction of a plant at Gonzales, Texas, which will be entirely devoted to the handling of these by-products.

The assertion is made that the industry has passed the stage of speculation and experiment, and that the new company will shortly be prepared to enter the market with all of the products named above. When it is stated that a conservative estimate of the average annual yields of stalks in this section may be placed at 70,000,000 tons, the importance of the discoveries is convincingly apparent. The profit in the conversion of this waste into sugar at remunerative rates is seen at a glance. The possibilities along the other lines mentioned are of commensurate value, and it can easily be imagined that hereafter southern farmers will keep a vigilant eye on the plant in Texas ere treating their cotton stalks as mere encumbrances.

The scepticism with which the proposition to commercially treat waste cotton seed was received is a comparatively recent memory. Not only the farmers but many of the cotton experts viewed the announcement that the oil and hulls produced would be of immense value to the industries of the South as a phantasy on the part of a few scientific fanatics. The fortunes which have been made along these lines in late years, and the direct profit to the farming element, came in the light of a silencing rebuke to all scoffers. Of similar force is the marvellous manner in which applied chemistry and mechanics have succeeded in wresting invaluable by-products from corn husks, which had previously been fed to cattle or made into bonfires to clear the land of what was popularly conceded to be a useless burden.

Since the occurrence of these events farmers have been wont to view with respectful attention all the efforts of business science in their behalf. Thus they are fully prepared for the dictum which gives a definite if small value to their waste cotton stalks. If the enterprises based on the theories of the Philadelphia and Texas contingent materialise as satisfactorily as there is reason to hope they will, both large and small farms will be endowed with an increasing earning capacity which, though perhaps not pretentious in the single instance, will be sufficient to make it a decided factor in the yearly calculations. A leading consideration, moreover, is the fact that all income from this source will be clear profit—since it will come from material hitherto regarded as merely incidental to the cultivation of the cotton crop.—*Atlanta Constitution.*

Answers to Correspondents.

THE LEEKE GROUND INCUBATOR.

J. H. Spell, Sheep Station Creek, Kilcoy.—

As we have no personal experience of this novel incubator, we would suggest your communicating with the inventor, Mr. H. Somerset Leeke, Kerangara, Fishergate, near Broadmount, who will be pleased to give all the information you desire.

Times of Sunrise and Sunset, 1905.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·43	6·18	5·59	5·45
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·44
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·43
5	5·1	6·47	5·24	6·40	5·44	6·15	6·0	5·42
6	5·2	6·47	5·25	6·40	5·45	6·14	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·13	6·1	5·40
8	5·3	6·47	5·27	6·38	5·46	6·12	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·11	6·2	5·38
10	5·4	6·47	5·28	6·36	5·47	6·10	6·3	5·37
11	5·4	6·47	5·29	6·35	5·47	6·8	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·7	6·4	5·35
13	5·6	6·47	5·31	6·34	5·49	6·6	6·4	5·34
14	5·7	6·47	5·32	6·34	5·50	6·5	6·5	5·33
15	5·8	6·47	5·32	6·33	5·50	6·4	6·5	5·32
16	5·9	6·46	5·33	6·32	5·51	6·3	6·6	5·31
17	5·10	6·46	5·34	6·31	5·51	6·2	6·6	5·30
18	5·11	6·46	5·34	6·30	5·52	6·1	6·7	5·29
19	5·11	6·46	5·35	6·29	5·52	6·0	6·7	5·28
20	5·12	6·46	5·36	6·28	5·53	5·58	6·8	5·27
21	5·12	6·46	5·36	6·27	5·53	5·57	6·8	5·26
22	5·13	6·46	5·37	6·26	5·54	5·56	6·9	5·25
23	5·14	6·45	5·38	6·25	5·54	5·55	6·9	5·24
24	5·15	6·45	5·39	6·24	5·55	5·54	6·10	5·23
25	5·16	6·44	5·40	6·23	5·55	5·53	6·10	5·22
26	5·17	6·44	5·40	6·22	5·56	5·52	6·11	5·21
27	5·18	6·44	5·41	6·21	5·56	5·51	6·11	5·20
28	5·19	6·43	5·41	6·20	5·57	5·50	6·12	5·19
29	5·20	6·43	...	...	5·57	5·49	6·13	5·18
30	5·20	6·12	...	...	5·58	5·48	6·13	5·17
31	5·21	6·42	...	...	5·58	5·47	...	...

Phases of the Moon.

			H.	M.
6 Jan.	●	New Moon	4	17 a.m.
14 ,,	☾	First Quarter	6	11 ,,
21 ,,	○	Full Moon	5	14 p.m.
28 ,,	☽	Last Quarter	10	20 a.m.
4 Feb.	●	New Moon	9	6 p.m.
13 ,,	☾	First Quarter	2	20 a.m.
20 ,,	○	Full Moon	4	52 ,,
26 ,,	☽	Last Quarter	8	4 p.m.
6 Mar.	●	New Moon	3	19 p.m.
14 ,,	☾	First Quarter	7	0 ,,
21 ,,	○	Full Moon	2	56 ,,
28 ,,	☽	Last Quarter	7	35 a.m.
5 April	●	New Moon	9	23 a.m.
13 ,,	☾	First Quarter	7	41 ,,
19 ,,	○	Full Moon	11	38 p.m.
26 ,,	☽	Last Quarter	9	14 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures :—

1905.	Rockhampton. Rise.	Rockhampton. Set.	Townsville. Rise.	Townsville. Set.	Cooktown. Rise.	Cooktown. Set.
January ...	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February ...	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March 1 to 20 ...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
,, 21 to 31 ...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April ...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Eating, per packer	...
Apples, Canadian	...
Apples, Tasmanian, half case	6s. 6d. to 7s. 6d.
Apples, American, Eating	...
Apples, American, Green	...
Apricots, quarter-case	4s. 6d. to 5s.
Apricots, American, per 108's	...
Bananas, per dozen	...
Bananas, per bunch	...
Cape Gooseberries, quart	...
Cherries, quarter-case	...
Custard Apples, quarter-case	...
Grapes, per lb.	1d. to 2½d.
Granadillas, case	...
Gooseberries, English	...
Lemons, per case	1s. to 2s.
Lemons, Italian, per case	6s. 6d. to 7s.
Lemons, Italian, per 180	...
Lemons, American, per 180	...
Loquats, half-gincase	...
Mandarins, Local, per case	...
Mandarins, Bowen	...
Mangoes, half-case	1s. 6s. to 2s.
Mangoes, good, half-case	5s. to 6s.
Melons, per dozen	2s. to 3s.
Nectarines, quarter-case	3s. 6d. to 4s.
Oranges, Italian, per 180	...
Oranges, American, per box	12s. to 14s.
Oranges, Sydney (packers)	...
Passion Fruit, quarter-case	2s. to 2s. 3d.
Papaw Apples, per case	...
Peanuts, per lb.	...
Pears, half-case	8s. to 9s.
Pears, medium, half-case	5s. to 6s.
Peaches, half-gincase	5s. 6d. to 6s. 6d.
Pineapples, per dozen	6d. to 1s.
Pineapples (rough leaf), per dozen	...
Plums, American, per 108's	...
Plums, quarter-case	3s. to 3s. 6d.
Plums, Blood, quarter-case	2s. to 2s. 6d.
Rockmelons	...
Rosellas, per sugar-bag	...
Seville Oranges, apple-case	...
Tomatoes, quarter-case	1s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY.

Article.		January. Prices.
Bacon (Pineapple)	lb.	5½d. to 7½d.
Barley, Malting	bush.	2s. 6d. to 3s. 1d.
Bran	ton	£2 7s. 6d. to £2 15s.
Butter, Factory	lb.	8½d. to 8¾d.
Chaff, Mixed	ton	£2 10s.
Chaff, Oaten	,,	£2 10s. to £3 12s. 6d.
Chaff, Lucerne	,,	£2 5s. to £2 15s.
Chaff, Wheaten	,,	£1 15s.
Cheese	lb.	5½d. to 6d.
Flour	ton	£8 10s.
Hay, Oaten	,,	£4 10s. to £4 15s.
Hay, Lucerne	,,	£1 10s. to £2
Honey	lb.	1¼d. to 1½d.
Maize	bush.	1s. 11d. to 2s. 7d.
Oats	,,	2s. to 3s. 8d.
Pollard	ton	£4 5s. to £4 10s.
Potatoes	,,	£6 10s. to £10 15s.
Potatoes, Sweet	,,	£5
Pumpkins	,,	£2 5s. to £2 10s.
Wheat, Milling	bush.	3s. 3d. to 3s. 7d.
Wheat, Chick	,,	2s. to 2s. 6d.
Onions	ton	£10 to £15.
Hams	lb.	8½d. to 10d.
Eggs	doz.	2½d. to 5½d.
Fowls	pair	1s. 9d. to 3s.
Geese	,,	3s. 9d. to 5s.
Ducks, English	,,	2s. 3d. to 3s. 6d.
Ducks, Muscovy	,,	3s. to 4s. 6d.
Turkeys, Hens	,,	3s. 6d. to 7s.
Turkeys, Gobblers	,,	9s. to 14s. 6d.

ENOGGERA SALES.

Animal.	December. Prices.
Bullocks	£8 15s. to £10.
Cows	£7 5s. to £8 10s.
Wethers, Merino	19s. 9d.
Ewes, Merino	7s. 3d.
Wethers ,, (shorn)	17s.
Wethers, C.B.	21s. 9d.
Ewes, C.B.	18s. 3d.
Lambs	16s. 3d.
Pigs (Suckers)	8s. 9d.

Farm and Garden Notes for February.

Field.—During this month the land intended for potatoes should be ready for planting. Plant only small potatoes whole. If large potatoes are cut into sets, there is risk of their rotting, as the usual wet weather may be expected with a hot muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep, rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, Kafir corn, imphee, sorghum, and vetches may be sown, but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop sow Swede turnips and mangoldwurtzels.

Kitchen Garden.—Make preparation for good crops of vegetables for the early winter by ploughing or digging all unoccupied ground, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, prepared as follows:—

Spread a layer of black soil on the ground; dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes and plaster (gypsum), so that the compound shall contain the following proportions:—

Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel; plaster, 1½ bushels. Mix thoroughly, and, a little before planting, moisten the heap with water, or better still with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbage and cauliflowers ready for transplanting. Do this during the month. The middle of January (now past) and the middle of March are the best times to sow the seed. Sow "Eclipse" or other large Asiatic variety. If the aphis appears, spray the plants with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbages, cauliflowers, cress, peas. Should the weather be dry after January rains, give the plants a good soaking of water. Gather all fruit of cucumber, melon, French beans, and tomatoes, to ensure the continued productiveness of the vines.

Flower Garden.—Thin out and tie up dahlias. Keep the weeds down, never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, asters, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemums, verbenas, petunias, penstamons, &c. Dianthus sown now and planted out in March will bloom during the whole year if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep. On the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should only be covered with fine soil to a depth equal to their own size—for instance, a sweet pea is about one-eighth of an inch in diameter; therefore cover it with one-eighth of an inch of soil.

Farm and Garden Notes for March.

Farm.—Take every opportunity of turning up the ground in readiness for sowing and planting. The main crop of potatoes should be at once planted. As the growth of weeds will be slackening off, lucerne may be sown on deeply-cultivated soil. The latter should be rich and friable, with a porous subsoil, and should be thoroughly pulverised; do not waste time and money in trying to grown lucerne on land with a stiff clay subsoil. The land for lucerne should be prepared a couple of months before sowing, care being taken to cross-plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed per acre will be required; in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Lucerne seed is worth from 56s. to 65s. per cwt. in the British market. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is too late to sow maize, even 90-day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and swede turnips may be sown. In Northern Queensland, sow tobacco seed, cow-pea, Carob beans, sweet potatoes, opium poppy, &c. Sow anatto, Jack fruit, and plant kola-nut cuttings. Some temperate zone vegetables may be planted, such as:—Egg plants, potatoes, &c. Coffee-planting may be continued. Harvest Kafir corn and paddy.

Vegetable Garden.—As this is the month during which a very large variety of vegetables may be sown, a few brief notes on some of them will be of interest and use, especially to new beginners. Some vegetables may be sown where they are to remain and produce a crop, but most of them are best raised from seed in seed beds, to be afterwards transplanted. The seed beds require careful preparation. The soil should be a friable sandy loam, and must be as clean as deep cultivation, the removal of roots, and the destruction of weed seeds can make it. It must be fairly rich, or must be made so with well-rotted manure or leaf-mould. A clayey soil is to be avoided, yet it should not readily fall away from the roots when the plants are lifted. A light shade of bush material should be provided, not dense, but just sufficient to allow the broken sunlight to fall on the young seedlings. Ti-tree boughs are the best for this purpose. They can be supported on forked sticks and saplings. As the plants grow, the shade should be reduced, otherwise they will, in seeking the light, grow up spindly and weak, and no such seedling will ever make a satisfactory plant. Sow the seeds thinly in drills, and instead of raking them over, which process often results in the seeds being dragged into a heap, shake fine leaf-mould thinly over them, bearing in mind that vegetable seeds should not be covered deeper than their own diameter. When watering, do so in the evening, and next day stir the soil gently between the drills to prevent the possibility of the soil baking.

Broad Beans.—This vegetable likes a stiff, deeply-cultivated soil, well drained and heavily manured. Mark out the rows 2 feet apart if a dwarf variety is sown, and 3 feet apart for the tall sorts. Set each seed 5 inches apart in the rows. About 4 quarts of seed will be sufficient for an acre. As soon as the beans are set, nip off the tops of the plants to make them throw all their energy into maturing the beans.

French Beans.—These may be sown at the same distances apart as broad beans, but the soil should be lighter and warmer than for the latter; 2 quarts are sufficient for 1 acre. They may be covered 1 inch deep, and as they grow,

hill them up. This helps to retain moisture and to support the plants. The running or climbing varieties should have their runners cut, to throw strength into the pods.

Beets.—Sow the seeds where there is abundance of light and in the position where they are to mature. If necessary, however, they may be transplanted. The soil must be dug deeply, and even trenched two spades deep, digging the manure deep down to induce the tap-root to go down in search of the food, of which they take up great quantities. Beets are a very exhausting crop. Mark out rows 18 inches apart, scatter a little fine soil along these rows and sow the seed on it as thinly as possible, because the plants will have to be thinned out to 9 inches apart from plant to plant. The seeds should be steeped for 12 hours in cool water, and be sown whilst still damp. Cover to about half an inch. Two ounces of seed are required for an acre.

Broccoli.—Broccoli thrives admirably in this State, but it will not grow properly in the hot summer months. It requires a rich, deep, light soil, and should never be planted on ground which has previously been under any of the cabbage family. The seed bed should not be shaded by trees, the movable shade above mentioned is all that is needed. When planting out place the plants about 2 feet to 2 feet 6 inches apart. White and Purple Cape, Grange's Early White, and Elletson's Mammoth are good varieties. Two ounces of seed will suffice for an acre.

Brussels Sprouts.—This excellent vegetable thrives best in the cooler portions of the State, such as the Darling Downs. It is best grown on poor soil. The plant rises up with a very long stem. The top leaves form a spreading head. The large leaves should be broken down to facilitate the formation of the little cabbages which are produced from the axil of every leaf. Heavy manuring should be avoided, as it causes loose, tasteless sprouts to be formed. The sprouts should be gathered when they have the appearance of half-blown roses. Plant out in rows 3 feet apart with 2 feet between the plants in the rows. Two ounces of seed will sow an acre.

Cabbage.—The magnificent cabbages seen at the various shows afford ample evidence that the climate is admirably adapted for their production. Cabbages love a deep, rich, open soil. Give them plenty of manure and frequent watering. The seed may be sown broadcast and thinned out afterwards, but generally it is preferable to sow in seed beds and transplant. Sow in drills and cover lightly with leaf-mould. Then water gently. When the seedlings are from 4 to 6 inches high transplant them into rows from 18 inches to 2 feet apart according to varieties. It is well to snip off the extreme ends of the roots before planting out. Digging between the growing crops will be of great advantage in keeping the soil loose. After digging, draw some soil up to the stems of the plants. Mulching, liquid manure, and a little lime are all factors in producing large, well-flavoured cabbages. St. John's Day, Early York, Large York, London Market, Sugar Loaf, King, and Flat Dutch are good early and medium sorts, whilst for late crops Schweinfurt and Drumhead are suitable.

Savoy Cabbage does well here. Its cultivation is the same as that for ordinary cabbages. Dwarf Green, Curled, and Drumhead are the varieties usually grown.

Cauliflowers.—For the cultivation and treatment of cauliflowers, see Part I. (Jan., 1904) of this *Journal.*

Carrots.—The carrot requires a light, rich, sandy loam of considerable depth, which should be dug two spades deep. The ground should have been heavily manured for a previous crop; thus the manure will be evenly distributed throughout, and good clean carrots will result. Get the surface of the ground fine, and sow either broadcast or in drills. As the seed is liable to hang

together, it should be well rubbed in the hands, mixed with sand to separate it previous to sowing, and, as it is very light, it should be sown on a calm day. On light soil, not subject to binding in wet weather, the seed should be gently and evenly trodden or rolled in, and then raked. On land of a more retentive nature, it should be raked in only. Thin the plants out to 5 or 6 inches apart, and ply the hoe freely to keep down weeds and stir the soil. Early Horn is a fine-flavoured carrot, and, on account of its habit of growth, is adapted for cultivation in soils which would be too shallow for other varieties. The Intermediate, Long Orange, and Altringham are suitable for deep soils, and the latter and the White Belgian are excellent food for cattle and horses.

Celery.—A good, deep, rich vegetable mould, in a moist situation, is that best suited for celery. For the seed bed or box, make up a mixture of fine loam, leaf-mould, and sand. Sow the seeds thinly, cover very lightly, preferably with sifted stable droppings or decomposed manure, and slightly shade them. When the plants are up and the rough leaf is a little advanced, prepare a bed by mixing 2 inches in depth of well-rotted manure with about 3 inches of the soil. Level the surface, water thoroughly, and, a few hours afterwards, in the evening, plant out the seedlings 5 or 6 inches apart. Slightly shade them, and then prepare a similar bed for planting out for succession. For the final planting, throw out trenches 1 foot broad and 1 foot deep, at 5 feet apart from centre to centre. At the bottom, lay 4 inches of well-rotted manure, and dig it in with a fork. Give the whole a good soaking with water. Now take up your plants, being careful to leave a ball of earth on the roots. Now take a stiff piece of brown paper, and make a collar or case, and wrap it round the lower part of the plant, leaving the top free. As the plant grows, this can be lifted. The object of this is to enable you to heap in the soil against the plants, without any of it getting inside them. Keep on drawing the earth up to them, to within 6 inches of the top. This must always be done in dry weather. Give plenty of water, and occasionally some liquid manure. A little salt sprinkled on the soil once or twice, followed by a good watering, will be beneficial. One ounce of celery seed will be sufficient to plant out an acre. We have blanched celery by letting the plants grow to 1 foot or 15 inches, and then enclosing them in an earthenware drain pipe. The whole of the plant inside the pipe was perfectly blanched.

Onions.—A rich, mellow soil, with a dry subsoil, is what onions demand. Give the ground a deep digging in January or February, with a good supply of manure, leaving it as rough as possible. At the end of February, give the ground a good dressing of soot and ashes, and dig it over, breaking all the lumps. Throw it up into beds of convenient width, and sow rather thickly in drills 1 foot apart and 1 inch deep. Tread the seed in firmly, and rake over lightly. When the plants are 6 inches high, transplant into beds similarly prepared, into rows 15 inches apart and 8 inches from plant to plant in the rows. In transplanting, only the root must be placed in the ground, the little bulb must be above it. By planting deep, the proper development of the bud is prevented. Keep the ground perfectly clean during all the growing time, and when the leaves begin to turn yellow bend down the tops just above the bulb to facilitate ripening. Onions may also be sown in drills and thinned out to 8 or 9 inches between the plants, the plants which are removed being used either to fill up misses or to form new beds. About 8 ounces of seed will serve for an acre. The best time to plant out onions is April, but splendid crops have been got by sowing in September.

Leeks.—Leeks may be treated when transplanted from the seed bed in the same way as celery—namely, by planting in trenches and earthing up. The leaves may be shortened back two or three times during the growing season.

Lettuce.—Sowings of lettuce may be made monthly for succession in seed beds. In very rich soil, lettuce may be sown and afterwards thinned out to

15 inches apart. Cos lettuce may be blanched by tying the plant round with banana fibre, bringing the top to a point, so as to prevent the rain entering.

Endive.—This salad plant may be cultivated and treated like the lettuce.

Garlic.—Garlic, like eschalots, is propagated from the young bulbs. They should be planted in the winter. Press the lower half of the bulbs into the soil. Leave them in this state, without covering, until the spring. Then, when hoeing, draw the soil over them, so as to form a level surface. The soil that suits onions will also suit garlic.

Eschalots.—These may be propagated throughout the year by division of the roots. Plant in the same way as onions, in rich, sandy soil, and keep them well watered. By planting them on the top of small ridges, the roots only will be in the ground, and the bulbs will develop like small onions.

Parsnips.—These are cultivated in the same way as carrots. They take a long time to come to maturity.

Peas.—Peas may be sown from January to May, and even later. Yorkshire Hero, sown in May or June, is an excellent cropper. They require a rich, light, well-drained soil. They should not be sown too thickly. The dwarf sorts should be sown in drills 2 feet 6 inches asunder, the peas being thinned out to 5 or 6 inches apart in the rows. The very tall varieties should be planted 8 feet apart, and two rows of cabbages may be grown between.

Kohl-rabi.—This excellent vegetable is not appreciated in Queensland as it should be. It is really a turnip-rooted cabbage. It should be planted on heavily-manured land, 18 inches apart each way. The bulbous portion of the root above ground and the youngest leaves are eaten. They should be gathered quite young, as the turnip-like flesh inside toughens with age.

Spinach.—Sow thinly in well-dug, well-manured land, in drills 18 inches apart, and thin out to 9 inches apart, using the young plants for table. When the plants are well developed, keep on using the outside leaves for culinary purposes until the flower stalks appear. The prickly spinach is the most hardy and best suited for the winter crop—the round variety for the summer crop.

Radish.—Sow occasionally throughout the year on rich soil. Sow thickly, and thin out as they come on. Make sowings about every fortnight for a succession.

Rhubarb.—Rhubarb roots are so easily procurable from seedsmen that we do not advise market gardeners to go to the trouble of raising plants from seed. If the seeds are sown in August, it will be June before the roots are ready to plant out for good. Plant the roots 2 feet apart each way, in very rich, moist soil, free from stagnant water below. Water occasionally while growing with a weak solution of guano, liquid manure, or soapsuds. Cut the flower stems as they appear. Should they appear during the first year, it is a sign that the ground is not rich or strong enough or has been badly prepared. Mulch during the hot weather.

Artichoke (Jerusalem).—Jerusalem artichokes are propagated like potatoes. They will thrive in any situation, and spread so much as to become troublesome to eradicate. Plant in the spring, but even in February and March if tubers have not been available before those months. Plant 15 inches apart, in rows 3 feet apart.

Artichoke (Globe).—This is another of the vegetables neglected in Queensland. The plant is propagated by means of suckers, which are planted early in spring, when about 10 inches high, in rows 4 feet apart, and 3 feet from plant to plant, in deep, rich, moist loam, well manured. The situation should

be open. Shade with large pots, and water freely in dry weather. In October, remove all small suckers, and mulch the ground with 3 inches of manure. The beds will last five years.

Asparagus.—For asparagus beds, the very best soil must be chosen. The best is a good, deep, sandy loam, dug deep, and well manured. A sprinkling of salt should be added to the surface a month or two before the planting season. Just before planting, the ground should have another good dressing of well-rotted manure, be again trenched, at least 2 feet deep, and again well sprinkled with salt. During May or June, mark out the beds 4 feet wide, running north and south. Cut a trench 6 inches deep perpendicular about 9 inches from the side; against this place the plants, at 15 inches asunder, with great care, spreading the roots out, and leaving the crowns 2 inches below the surface. Fill in the earth quickly to avoid too long exposure. Now make two other rows in the same manner, and the bed is complete. Until the plants are established, give them plenty of water in dry weather. From September, right through the summer, apply liquid manure plentifully, twice a week, and also give a dressing of salt every month. In May, cut the stalks down, and dig the beds lightly over with a fork, at the same time digging up the paths between them. For the winter, cover the beds with a good dressing of manure. Begin to cut in September, using a long knife, and cutting below the surface. To ensure the tender shoots being well blanched, the European growers place earthen pipes or wooden tubes, about 1 foot long, over them.

Herbs.—No vegetable garden is complete without herbs. These are generally easy to raise from seed. If plants can be obtained, so much the better. They may be sown any time between April and August. Each particular variety should have a small bed, about 3 feet wide, to itself.

Fennel is propagated from seed or by division of the roots.

Marjoram.—Sow in light soil, and thin out, or in boxes. It grows and spreads rapidly.

Mint.—Propagated by division of the roots. Will grow in any fair garden soil, and spread rapidly, the roots running a long distance underground, and sending up shoots at every joint.

Parsley.—This most useful herb may be sown two or three times a year, but preferably in February or March and in August. Sow thinly, in drills 10 or 12 inches apart. When the plants are strong, cut them down, to induce strong, curled foliage. If not regularly cut, parsley plants will go to seed in one season.

Sage.—Like other shrubby herbs, sage may be grown from seed, by division of roots, and by cuttings.

Rosemary and *Thyme* are propagated in the same manner.

To Dry Herbs.—Gather on a dry day as the flowers are beginning to open. Carefully go over them, and remove dead leaves and any foreign matter. Tie in little bundles; hang in a dark, dry place, where a draught can get at them. When quite dry, rub off the leaves, sift, and clean out all dust and twigs. Then place the leaves in wide-mouthed bottles, and seal airtight. Do not on any account dry herbs by sun or fire heat. If they are treated as above, they will keep their flavour indefinitely.

Flower Garden.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, jacobean lilies, tigridia, tritonia. All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf-mould. Herbaceous plants

and annuals which it is intended to raise from seed should be sown this month. Such are—Antirrhinums (snap-dragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds, and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done. Now, as to climbers which may now be planted. These are—Allamanda Schotii (beautiful yellow); Antigonon leptopus, a charming cerise-coloured climber; Aristolochia elegans, handsome as an orchid and easily grown; Aristolochia ornithocephala (Dutchman's pipe), very curious, large, always attracts attention; Asparagus plumosa, grows in any shady place; Beaumontia grandiflora, splendid white flower, grand for a fence, will grow 50 feet high; bignonias of several kinds; bougainvilleas, with their splendid leafy pink and purple flowers rapidly clothe a fence or unsightly shed with a blaze of blossom; Quisqualis indica, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the Bauhinia scandens, rarely seen about Brisbane, not even in the Botanical Gardens. We grew a plant of this climber at Eton School, Nundah, and it soon closed in the front of the veranda for a distance of over 80 feet. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossom, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant, it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

Agriculture.

INOCULATING THE SOIL.

A correspondent of the *Wisconsin Farmer*, U.S.A., writing on the subject of inoculating the soil, which we described in the last issue of the *Journal*, thinks that if farmers were to improve their land by the help of bacteria supplied to their brains they would have little need for the application of bacteria to the soil. He puts down the impoverishing of the land to farmers working it while in a wet state, and allowing stock to tramp it down when in this condition. He declares that with a good rotation of crops and right cultivation the chances are he would get along right well without any bacteria at all to renew the fertility of the soil. Nevertheless, he does not wish to throw cold water on the good work of the Department of Agriculture in connection with Dr. Moore's bacteria. There are plenty of fields, both in America and Queensland, in need of all the fertility that inoculation of the soil will produce. This giving to the soil the "gold cure" may be all right; "but let us," he says, "get down to business in the first place, and prevent the disease that calls for the remedy." The editor of the above journal, commenting rather sharply on a few of the points advanced by the correspondent, says:—"In the first place there need be no special concern about the farmer's mind not being inoculated in due time by the germs of progress. Various agencies are at work disseminating agricultural information, chief among these being—the agricultural college, the experiment station, and the agricultural Press.

The cultivation of land when it is in proper condition is highly important if it is to be kept productive, but no amount of tillage at the right time will do away with the necessity of employing the organisms that live on the roots of legumes. Be it understood that when it is recommended that a good rotation and sensible cultivation will keep up a supply of fertility without the use of bacteria, there is in this very recommendation the advice to use these organisms, because good rotations in the central west include legumes, and these, of course, enrich the soil when the proper species of organism is on the roots."

We are quite in accord with the editor's remarks. There are in this country numbers of farms which have by continuous cropping so deteriorated from their original fertility that no decent crops can be grown on them without an expenditure for manures quite incommensurate with the value of any crop which can be produced on them. In the sugar districts leguminous crops are universally grown in order to restore nitrogen and humus to the soil. If this can be done without the amount of labour which this method of restoring soil fertility entails, we should think that the farmer who adopts the new plan gives good evidence that his brains are in the right place and require no bacteria to stimulate them to action. We believe that many farmers have written to the Department of Agriculture in Washington for a supply of the bacteria and other ingredients used in the process of soil inoculation, and we shall probably not have long to wait before hearing what results have attended their application to worn-out soils.

SOWING PASPALUM BROADCAST.

It is a very common remark that *Paspalum dilatatum* is more often likely to fail than to succeed when the seed is sown in preference to dividing old stocks and planting out individual roots. Where large areas are to be laid down in paspalum, it is obvious that the latter method is extremely tedious and expensive. But, however propagated, this grass is of immense value to the dairy farmer, owing to the quantities of green fodder it supplies during the summer months, when other grasses have withered and disappeared. How to be successful with a large area at minimum expense was the problem set to

himself by Mr. E. Pritchard, owner of Numba Estate, Victoria, who has lately succeeded in getting a good stand of 40 acres by broadcast sowing with perennial rye grass. The *Australasian* describes his experiment as follows:—

"A big factor in Mr. Pritchard's success with his dairy herd is the excellence of the pastures. A year or two ago he determined to give paspalum a trial, with the idea of obtaining a grass that would better withstand the effects of the midsummer sun. And in this he has been highly successful. It is generally held that paspalum will not grow from seed, and that to get it to start, individual roots must be planted at small distances apart, and then by allowing them to seed, gradually clothe the intervening spaces with young plants. It is the thought of this laborious method that has, no doubt, deterred many farmers from giving this valuable grass a trial.

The prospect of having to wait years for a pasture, and the expense entailed in the hand-planting, are certainly the chief causes that have operated against the general use of paspalum, for anyone who has seen it growing and seen the wealth of green food it supplies during the hot summer months, when all other grasses are either withered and dry or else have completely disappeared, must surely have been convinced that it was a grass well worth having. On this account, therefore, the evidence of Mr. Pritchard is extremely interesting. It is all the more important, too, from the fact that he did not dabble about with a few plots of a few feet square, such as many people do when carrying out experiments of this kind, but tried it on a large scale.

He planted one paddock of about 20 acres by hand, at distances of 3 feet apart. His intention was to plant the whole of an area of 60 acres in this manner, but it was so slow that he decided to sow the rest broadcast. After ploughing and thoroughly harrowing the land, so as to make as fine a seed bed as possible, he mixed the paspalum seed with perennial rye at the rate of one bushel of the former to two of the latter, and then broadcasted it over 40 acres. This was in March of last year. The season was not particularly favourable, but the rye grass germinated immediately and produced a magnificent crop of winter and spring feed.

During this time the paspalum lay dormant, and Mr. Pritchard gave up hope of its ever shooting. However, a few showers fell in the month of October, and, protected from the direct heat of the summer sun by the long stalks of the rye grass, the paspalum began to germinate. In a few weeks it was growing rapidly, and now it has entirely supplanted the other grasses, and is flourishing luxuriantly. That 40 acres of paspalum at the present time is a sight worth seeing, and would convince anyone who saw it that everything that was said about its wonderful drought-resisting properties was true.

All around, the meadow grasses are scorched, yet the paspalum is green and vigorous, and pasturing a large mob of cattle. Mr. Pritchard informed me that since he has turned his cattle on to that patch they have picked up in condition very much."

Commenting on the above, *Garden and Field* says:—

"The thought occurs in reading this account, Is it possible to sow paspalum with a crop of oats, or wheat, to be cut for hay? If the paspalum grew, a permanent pasture would be secured, and if it failed there would be no loss of labour."

Why not try it here? Many new dairy farms are being started in Queensland, and some farmers propose to lay down as much as from 200 to 500 acres of paspalum. The above successful experiment would seem to be well worth trying.

JUDGING POTATOES AT SHOWS.

Because a potato has a high-sounding name, and because it is a new variety, judges are satisfied to examine the interior and exterior of the raw potato and award it a prize or disqualify it according as its symmetry and healthy appearance appeal to their judgment. But does this examination

satisfy the public? What the farmer wants to know is, its cropping power and its powers of resisting disease, and its early or late appearance on the market. What the housewife wants to know is, what are its cooking properties. It is of little importance that a certain potato exhibit has obtained first prize, for a crop must be a very poor one if, out of 5, 10, or 20 acres a bag or two of tubers cannot be obtained which will satisfy a judge in all that concerns the eye. But there are splendid-looking potatoes which will not stand the cooking test. Some, when cooked, smell of the earth; others show none of that beautiful mealy appearance which is the characteristic of a good cooking potato. One that bursts its jacket when properly cooked, and shows a beautiful dry mealy exudation is surely preferable to one that is soapy or waxy. The market price of potatoes depends largely on the quality of the cooked tuber. At some shows the judges are supplied with a plate of hot cooked potatoes of each variety exhibited, and thus are able to determine what, after all, is the only true test of the value of a potato—its cooking qualities. Size is certainly not everything. It would be a move in the right direction if all potato exhibits at shows were accompanied on judging day by a dish of each variety cooked by an artist—for to cook a potato properly is a work of the culinary art not understood by all cooks.

A cooked potato competition lately took place at Marks Tey, Essex, when tubers were obtained from Scotland, Lincolnshire, and Essex. Twelve standard varieties were agreed on, and six tubers, weighing as nearly as possible 6 oz. each, of each variety were procured. Each sample was cooked in a separate pot. All were put in with cold water and boiled slowly on a large hot-plate. They were steamed for a few minutes before being served. All were judged under number, the judges not knowing the names of the varieties they were dealing with, nor the districts from which they came, except in the case of Up-to-Date. This was adopted as a standard, 9 points being given to the best dish of that variety. Samples receiving 9 points and upwards were considered "excellent"; those gaining 7 and 8 points, "good." The Essex varieties proved superior to all the others from the other two localities. The potatoes were judged for flavour, texture, and appearance when cooked. Charles Fidler and Lim Gray, both grown in Essex, proved the best with 11 points each. The much-valued American, Vermont Gold Coin, only took 7 points; King Edward VII., 9 points; whilst the now celebrated Northern Star and the equally expensive Eldorado, for which immense prices have been given, came out of the test with 6, 2, and 3 points and 2, 4, and 7 points, respectively, for samples grown in Essex, Lincolnshire, and Ireland. Yet the *Mark Lane Express* says:—"It seems like a fall from the mighty to read of King Edward VII. getting more points for flavour than such boomed sorts as Northern Star, Eldorado, Discovery, and Diamond, but so it proved in the test. The flavour of Eldorado we do not profess to know much about, because, up to this season, the idea of boiling such a treasure was out of the question . . . . but we shall stick to our own experience, as we have tried both Northern Star and Discovery, and consider them both infinitely superior to King Edward VII." The value of the tubers cooked for the test was £150, so if the judges had a humble meal, at least they had a most expensive one, as did also the pigs to whom the remains of the costly feast were passed on.

PROLIFICNESS OF THE NORTHERN STAR POTATO.

This lately new variety of potato, which brought enormous prices in England, has found its way to Australia, but we have, as yet, not heard of any results. As an instance of the extraordinary prolificness of this potato, we cite the case of a Scotch grower in East Fife. He planted one seed (about ¾-inch) on 12th April. It soon became apparent that the plant was outgrowing all the other potato plants. The ground was, therefore, cleared to allow it to come,

and at the beginning of October the plant was 18 feet in circumference. It excited great interest, and many potato-growers from the surrounding district went to see it. It was dug on 10th November, and had 125 tubers, many of which had not reached maturity. The weight was 18 lb. It was of the dark-leaved Northern Star variety.

Last season Major Boyd handed to Mr. A. Tulloch, Swan Creek, Warwick, a quantity of tubers of this variety and of the Sir John Llewellyn, which had been grown for him by Mr. C. Court, Mooloolah, from imported seed. The season was bad, but from 5½ oz. of seed over 12 lb. of potatoes were obtained. For these £4 10s. was offered and refused. It will be interesting to learn what results have followed Mr. Tulloch's experiments with these potatoes. Since the above was written Mr. Tulloch has dug the potatoes, and reported on them as follows:—"I am sorry to say that the Northern Star and Sir John Llewellyn potatoes had no chance of making a name for themselves this time. The potatoes were cut and planted on the 1st September, 1904, and came on splendidly, promising a fine return. They had just started to make tubers when the hailstorm of the 9th November cut everything to pieces. After a while they shot up again, the Northern Star making very large tops and going all to runners. The Sir John Llewellyn made some nice potatoes, which ripened early. They were dug and pitted the week before Christmas. The Northern Star are only just lifted (20th February, 1905), and the tops were still green. The ground under them was just a network of runners, and the potatoes very small. It is hard to tell how they would do in a good season, as, this time, they had no chance whatever. The Sir John Llewellyn made no second growth. It is a potato which will easily give two crops in the year. The Northern Star did nothing but make second growth after the hailstorm. The ordinary potato crop suffered in the same way. The seed is now nicely budded, and we would advise trying them in a milder climate, where the frost will not catch them."

Following are the results:—

Variety.	Date when Sown.	Date when Dug.	Average No. of Tubers per Plant.	Weight of Tubers.	Area of Ground Planted.	Total Yield.	Quantity Planted.
Northern Star ...	1 Sept.	20 Feb.	20	14 per lb.	50 sq. yds., or 3 drills of 25 yds. each	72 lb.	About 10 lb.
Sir John Llewellyn	1 Sept.	17 Dec.	2	8 per lb.	1 drill 37 yds. in length	18 lb.	

Thus, notwithstanding two bad seasons, the original 5½ oz. of seed have now increased to 90 lb., and, should the winter crop turn out well, a very large increase should result.

Mr. Tulloch has kindly consented to continue the planting, and has forwarded a small quantity of tubers to be again tried at Mooloolah.

MARKET GARDENING—WHEN TO SOW, PLANT, AND HARVEST.

We are so frequently asked to state when certain seeds may be sown or trees planted (although this information is regularly given in each *Journal* throughout the year), that we will ask our readers to cut out the following table and keep it handy. Those who file the *Journal* can, of course, always refer to it. It must be understood that the information here given is general,

as there are so many different climates in Queensland, even during the same season, that the farmer or gardener must depend a great deal upon his own experience and knowledge of the climatic conditions of his district to enable him to sow at exactly the right time. He will know whether his is an early or a late district, and must therefore arrange his planting to suit it. We also give in the third column, the average length of time required to mature a crop from the time of sowing.

VEGETABLES.

Variety.	Time to Sow.	Time Required to Mature.
Artichokes (globe)... / ,, (Jerusalem)	March or September. Transplant globe in autumn or spring	180 days
Asparagus (seed)	July or August	Seedlings may be planted out the second winter after sowing. A quicker plan is to buy the crowns from a seedsman. 150 days
Beans (French dwarf) ...	August to April	45 to 65 days
,, (French climbing)...	September and October ...	45 to 70 ,,
,, (broad)	March to May	
,, (Lima)	August to November ...	55 to 90 ,,
,, (Madagascar) ...	August to March	55 to 90 ,,
Beets	February to November ...	40 days
Cabbage	March, June, and December	In March it is best to plant imported seed, as local seed will not give good results as a rule. 100 to 175 days
Carrot	February to August ...	With care and plenty of water, carrots may be grown all the year round. 80 to 100 days
Brussels Sprouts	June, August, November, February	120 days
Cauliflower	December to February ...	100 to 125 days
Celery	January to March ...	150 days
Chokos	August to October ...	60 days
Cress	All the year round ...	30 to 40 days
Cucumbers	August and September ...	75 to 105 ,,
Culinary Herbs—		
Parsley	March to September ...	100 to 150 ,,
Sage	April to May	100 to 150 ,,
Thyme	,, ,, ...	100 to 150 ,,
Mint	Roots at any time during moist weather	50 to 70 ,,
Endive	February and March ...	65 to 75 ,,
Eschalots	All the year round ...	80 ,,
Garlic	February to May	120 ,,
Kohl-rabi	March to September ...	100 ,,
Kale	November to February ...	50 to 80 ,,
,, (seakale)	June to August	50 to 80 from second season of growth
Leek	March to July	100 to 120 days
Lettuce	February, April, August, September; practically all the year round	45 to 75 ,,
Mangelwurzel	March to July or August	300 ,,
Marrows	August to December ...	75 to 105 ,,
Onions	March to June	Spring onions, 60 to 90 days; mature onions, 120 to 180 days
Peas	,, to September ...	60 to 80 days
Potatoes (English) ...	February and August ...	100 to 120 ,,
,, (sweet)	September and October ...	180 to 210 ,,
Parsnips	February to August ...	100 ,,
Pumpkins	August to December ...	130 to 150 ,,
Radish	All the year round ...	40 ,,
Rhubarb	May to August	From 1 year old roots, 60 to 80 days.
Salsify	March to August	150 days
Scorzonera or Black Salsify	,, ,, ...	150 ,,
Spinach	,, to May	80 to 100 days
Tomatoes	July to September; January to February	130 to 190 ,,
Turnips	February to October ...	65 to 90 ,,
Yams	September	120 to 150 ,,

FIELD CROPS.

Variety.	Time to Sow.	Time Required to Mature.
Arrowroot	September	300 days
Barley	March and April	180 ,,
Broom Millet	August to January ...	180 ,,
Canaigre	April to September ...	1 year
Canary Seed	April, May, June ...	180 to 200 days. Sow 10 to 15 lb. per acre
Coffee	September	3rd year after planting
Cotton	August to October ...	180 days
Cowpea	January and September...	120 to 150 days
Earthnuts	August, September, and October	120 to 180 ,,
Fieldpeas	April to August	60 to 80 ,,
Flax	March to September ...	82 to 93 ,,
Grasses	August	
Imphee	July	120 to 160 ,,
Kafir Corn	February, September, and October	120 to 160 ,,
Lucerne	March to June	180 days, and thenceforward a crop can be taken off every six weeks
Maize	July to January	90 to 180 days.
Mangelwurzel	March and July	300 days
Millets	November and December	
Oats	March	150 ,,
Onions	April and May	120 to 180 days
Panicum	October to January ...	130 days
Potatoes	February and August ...	100 to 120 days
Pumpkins	August and September ...	130 to 150 ,,
Rape	April and September ...	48 to 60 ,,
Rice	September and October ...	90 to 180 days, according to variety
Rye	March and April	150 days
Sisal Hemp...	September (practically all the year round)	3rd year after planting; crops can then be taken off every four or six months
Sorghum	August to January ...	90 to 100 days
Sweet Potato	September and October ...	180 to 210 ,,
Sugar-cane	July to October	250 to 360 ,,
Teosinte	August to January ...	90 to 100 ,,
Tobacco	July to October	On coast 13 weeks, inland 15 weeks
Turnips	March to July	65 to 90 days
Wheat	April to June	180 days

FRUITS.

Variety.	Time to Plant.	Time before Fruiting.
Almonds	August	2nd year after planting
Apples	,, ...	2nd and 3rd year after planting
Apricots	,, ...	,, ,, ,,
Bananas	October, or during showery weather in spring and summer	2nd year after planting
Blackberries	September and October ...	,, ,,
Brazilian Cherries... ...	August	3rd ,, ,,
Cape Gooseberries... ...	,, ...	120 days
Cherries	,, ...	3rd to 5th year after planting
Citrons	,, ...	,, ,, ,,
Cumquats	,, ...	,, ,, ,,
Custard Apples	,, ...	5th to 6th ,, ,,
Figs	,, ...	1st to 2nd ,, ,,
Grape Vines (rooted) ...	,, ...	1st ,, ,,
Grape Vines (cuttings) ...	,, ...	2nd to 3rd ,, ,,
Guavas	,, ...	3rd ,, ,,
Granadilla	,, ...	240 days
Jack Fruit	October	5 years after planting
Loquat	August	2 ,, ,,
Lemons	,, ...	3 to 4 years after planting
Limes	,, ...	,, ,,
Mandarins	,, ...	3 years ,,
Mangoes	,, ...	2 to 3 years ,,
Mulberries	,, ...	,, ,,

FRUITS—*continued.*

Variety.	Time to Plant.	Time before Fruiting.
Melons	August to October ...	100 to 180 days
Nectarines	August	2nd year after planting
Oranges	,, ...	3rd to 5th year after planting
Pears...	,, ...	3rd to 4th ,, ,,
Passion Fruit	,, ...	Following season
Plums	,, ...	3rd year after planting
Papaw	October	2nd ,, ,,
Persimmon	,, ...	3rd ,, ,,
Peach	August	1st and 2nd year after planting
Pineapples	September, October, April, and May	2nd ,, ,,
Pomegranate	August	3rd to 4th ,, ,,
Quince	,, ...	,, ,, ,,
Rosellas	,, ...	Next season
Shaddock	,, ...	3rd to 5th year after planting
Strawberries	February to April ...	Next season

NOTE.—All trees are more safely planted when in a state of rest, as they are towards the close of the winter season. For this reason the planting of deciduous and evergreen trees should be carried out between April and August, or when the former have lost their leaves. Evergreens also should be put out during the winter, as the evaporation is less during this season. The times of first bearing of fruit trees cannot be given authoritatively, as much depends on the age of the trees at the time of transplanting, and on the climate, soil, aspect of orchard, seasons, and the amount of care bestowed upon them.

MR. FINDLAY AND THE POTATO.

CROSS-FERTILISING.—RAISING NEW VARIETIES.

In the course of a lecture before the Glasgow and West of Scotland Agricultural Discussion Society, Mr. Findlay, the celebrated raiser of so many new varieties of potatoes, spoke as follows on cross-fertilising and raising new varieties from seed:—

PRODUCTION OF NEW VARIETIES.

In the first place, I am distinctly of opinion that natural cross-fertilisation never took place in any part of the world at any period of the world's history. The blossom of the potato has a faintly sweet smell, yet it secretes no honey or nectar, and the pollen seems to be a bit too sharp and tasty to suit the palate of even the most voracious insect. In fact, it is highly poisonous, and I daresay that is where their objection comes in. I have seen now and again a bumble bee, no doubt attracted by the sweet smell of the blossom, alight on the edge of the petal, but never saw one explore the bloom, as is their habit where they expect to find either nectar or pollen. As the most casual observer will have noticed, the potato is an early closer, shutting up its blossoms between 2 and 3 o'clock in the afternoon, and, by reason of a certain twisting process, puts it out of the power of any nocturnal moth or other insect to gain access to either nectar or pollen, even though they both were there. In the second place, I hold it is utterly impossible for the pollen of one blossom to be wind-borne, and so fertilise another, even on the same plant, one reason being that it is too heavy, and another, and more important one, being that it is a bi-sexual plant. Both the sexual organs are in the same bloom, the anthers or pollen cases being the male parts, and the pistil representing the female. And it further appears to me that, for some reason which I have not been able to discover, the potato plant is by nature opposed to cross-fertilisation, for, immediately the pollen in the anthers is matured, the bloom twists itself up harder than ever round the pistil, and no longer opens out to greet the sun. The bloom then no longer stands erect on its stem, but begins to hang down, swaying in the breeze. The pollen falls down into the narrow space formed by the twisting of the petals, all around the bulbous point of the pistil. The bloom thus remains for the matter of two days, and then falls off. Strange to

say, the pistil only absorbs a very limited portion of the pollen. Yet what is left, so far as I have been able to discover, is perfectly inert. The potato, as I have already said, is, in my opinion, opposed to cross-fertilisation.

HOW HE RAISES FROM THE SEED.

Continuing, Mr. Findlay said, dealing with his method of working:—First I get a shallow seed pan, such as gardeners use, attend to the drainage, fill it up, or nearly, with well-decomposed leaf mould, to which has been added a little fine sand. I take a flat piece of wood, and beat it down fairly firm and level, and sow the seeds thinly and evenly over the flat and firm surface. That done, I take and sift, after adding more sand, some more of this leaf mould. The sifting will remove all grit and stones. Now sprinkle a small portion over the seeds, but see that you do it evenly and not over-thick—as near to an eighth of an inch as you can; give also a slight beat down. If the mould is fairly moist, you need not give any water for at least two days. Set your tray, to be out of the way of mishap, into the sunny corner of a cold frame. Put a piece of old newspaper or other paper over the tray, covering up with a piece of glass. Your great care now is to see that you do not allow the earth or mould to get dry; at the same time you must guard against making it too wet. In a week or ten days your seed should begin to braird. You must then give them more light and air. With average care, in a very short time you will have nice plants. When about an inch high, put them out in small pots singly. In another three weeks or so, if the weather is suitable, and the season far enough advanced, plant them out in the open where you mean them to be permanently. After this, your work is all in the ordinary course; only, remember this, you must take care when you harvest them to keep the produce of every plant by itself—I mean those you intend to grow again. Fifty per cent. or more will be of no use to go further with; and this 50 per cent. left year by year, you, if wise, will further reduce, until at the end of four years you have only one or two left as the sole representatives of your labour and care.

EARTHNUTS.

One of the easiest crops to grow, whether by itself or between the rows of some crop which takes from one to three years to mature, such as pineapples, sisal hemp, &c., is the earth or pea nut. In the United States they are grown by almost every farmer. The nuts always command a ready sale for oil-making. In America they are considered the best of pig food, and thousands of bushels are used for human consumption. An American farmer in Florida sums up the advantages of growing peanuts as follows:—They have no insect enemies; you are always sure of the crop; they will withstand more dry weather than any other crop; poor, sandy land that will not grow any other crop to pay will give a fine crop of peanuts; such lands will yield 50 bushels per acre of nuts without any further fertiliser when they would not yield 8 bushels of corn. The vines make the finest of hay when properly cured. Pull the vines in the evening, expose them to next day's sun, take them in in the evening, and you will have the sweetest of hay. Horses will leave lucerne to eat peanut hay. Peanuts are the best hog feed he ever tried. You can get 2 bushels of nuts ready for the pigs while you would be shelling 1 bushel of corn. Peanuts fatten hogs faster than anything else, and will keep them healthier. Some people say there is no money in peanuts. This farmer knows there is, for he gets money all the year round from them. Plant the rows 3 feet apart and the hills 1 foot apart. Keep clean, and you need not worry about the yield. If you plant in September (Queensland) they will be ready to harvest in January. They are a most valuable crop. For full information on this crop, see *Queensland Agricultural Journal*, Vol. XII., pp. 314, 397; Vol. XIII., pp. 5, 215; Vol. XIV., p. 313; Vol. XV., p. 615.

COST OF A BUSHEL OF WHEAT ON FALLOW.

At the February meeting of the Saddleworth branch of the South Australian Agricultural Bureau, the following estimate of growing wheat on fallow on his farm in 1904 was submitted by Mr. F. Coleman, who said:—"Some members value a team of six horses higher than given below; with others the cost of ploughshares would be greater; but their tillage operations possibly lighter and rent less. On the whole, the estimate was accepted as a fair one for wheat on fallow. If a stubble paddock is cropped, it is now generally put in for a hay crop; the cost, of course, is a good deal less both in working and in rent. In valuing tillage operations the cost of the team, depreciation, and wear and tear varies a good deal. The figures below relative to feed are from actual experience. The chaff was a mixture of sheaved wheaten and Cape oaten hay, mixed as cut, the long hay wheaten, the sheaves averaging about $7\frac{1}{2}$ lb. each:—

Basis for cost of cultivating, cost of team six horses, with plough, &c., one man one day.

	£	s.	d.
Feed, $2\frac{1}{2}$ bags (40 lb. each) chaffed hay and 24 sheaves hay ...	0	4	7
Depreciation and loss on team, value £120, at 15 per cent. ...	0	1	3
Depreciation, wear and tear plough (3 furrow), 10 per cent. ...	0	0	6
Wear and tear harness, 3d.; new shares, 7d.	0	0	10
Man, including board, at 27s. 6d. per week	0	4	7
Total cost team and man one day	£0	11	9
Cost team three horses, drill, one man one day.			
Feed, labour, &c., as above	0	8	2
Depreciation on drill	0	1	0
Total cost team one man one day	£0	9	2
Cost team four horses with harvester, one man one day.			
Feed, labour, &c., as above	0	8	11
Depreciation on harvester (£100)	0	8	0
Total cost team and harvester one day...	£0	16	11
Cost of acre of wheat on fallow, Saddleworth.			
Ploughing, 4 acres a day	0	3	0
Scarifying twice, at 1s. 6d., 8 acres a day	0	3	0
Harrowing twice, at 4d.	0	0	8
Drilling seed and manure	0	1	0
Seed wheat, 1 bushel per acre	0	3	4
Manure, 1 cwt. superphosphate	0	4	3
District council rate, 4d.; land tax, at $\frac{3}{4}$d. in £, 4d. (2 years)	0	0	8
Reaping, cleaning, and bagging with harvester	0	2	6
Rent or interest for two years	0	8	8
Total cost one acre	£1	9	7

As to the returns, many factors go towards the success or failure of our wheat crops. The average on this farm last year was 15 bushels 32 lb. clean market grain. For the last four years the average is 19 bushels 55 lb. per acre. Taking last year's return:—

	£	s.	d.
Value of crop of 15 bushels 32 lb., at 3s. $1\frac{1}{2}$d.	2	8	5
Cost of growing 1 acre	1	9	7
Profit per acre	0	18	10
Profit per bushel	0	1	2

Carting to market from farm is not included in the above. In connection with the above, Professor J. Wrightson's estimated cost of growing an acre of wheat in England is of interest:—

	£	s.	d.
Filling, cartage, and spreading manure	0	10	0
Ploughing with three horses and driver, 1 acre a day ...	0	10	0
Pressing, one-third cost ploughing	0	3	4
Two harrowings, heavy drays, four horses, at 1s.	0	2	0
Six harrowings at 6d., 3s.; drilling, four horses, 1s. 10d. ...	0	4	10
Harrowing after drilling, 6d.; birdscaring, 1s.	0	1	6
Seed, 2½ bushels, at 4s. 6d.	0	11	3
Spring harrowing, 1s.; spring rolling, 1s.	0	2	0
1 cwt. nitrate of soda, at 11s.; 2 cwt. superphosphates, at 3s. 6d.	0	18	0
Harvesting, 15s.; threshing, 8s.; dressing, 1s.	1	4	0
Marketing	0	5	0
Rent, rates, and taxes	1	15	0
Total cost 1 acre...	£6	6	11

If stripper and winnower are used, the cost would be:—For stripping, 2s. 6d.; cleaning, 5d. a bag, or 1s. 8d. an acre (four-bag crop), making total, with stripper instead of harvester, £1 11s. 3d.

Return, 1904 crop, 15 bushels 32 lb. clean wheat, at 3s. 1½d., £2 8s. 4½d.; leaving profit, with harvester, of 18s. 8½d. per acre; or, with stripper and winnower, of 17s. per acre; equal to 1s. 2d. and 1s. 1¼d. per bushel profit respectively.

The above estimate is for wheat alone, and returns from stubble for grazing and value of straw and cocky chaff form, of course, part of the return."

Finally, he remarks:—"Wheat cannot be grown at a profit at 17s. per sack (4 bushels)."

The members of the branch generally approved the estimate as a fair one for the district. With some the item of ploughshares would be heavier; possibly rent a little less if stony ground. Mr. Frost considered value of team too low at £120, but 15 per cent. depreciation and risk of loss would meet the case probably.

At the same meeting Mr. G. Benger read a short but interesting paper on:—

PROFIT IN POULTRY.

He had 60 hens in all, and they laid a total of 7,866 eggs, as under:— January, 26 dozen, value 19s. 6d.; February, 37½ dozen, value £1 14s. 4½d.; March, 67 dozen, value £3 7s.; April, 44 dozen, value £2 18s. 8d.; May, 35 dozen, value £2 9s. 7d.; June, 25 dozen, value £1 7s. 1d.; July, 19 dozen, value 17s. 5d.; August, 42 dozen, value £1 6s. 3d.; September, 118 dozen, value £2 16s. 6½d.; October, 103 dozen, value £2 7s. 2½d.; November, 90 dozen, value £1 19s. 4½d.; December, 49 dozen, value £1 3s. 5¾d.; total return, £23 6s. 5¾d. for eggs; and for young roosters, &c., sold, £2 3s. 7d. was received. In addition to the food they picked up about the farm, the fowls received 12 bags of screenings, worth 7s. per bag, or a total cost of £4 4s., leaving a profit of £21 6s. 0¾d. The fowls were simply the ordinary farm fowls, of no particular breed. Members considered the results satisfactory. Fowls kept in this way require the minimum of attention and keep, are very healthy, and lay well.

The above particulars we take from the South Australian *Journal of Agriculture*.

LUCERNE.

Experience has shown that in the cooler districts of Queensland, April is the best month in which to sow lucerne, because about this time weeds have to a great extent disappeared, and the young lucerne plants have time to get into the three-leaved stage before the setting in of the heavy frosts of June, July, and August. The plants demand a rich, deep soil, and, therefore, where the soil of a farm is shallow, but the subsoil can be easily worked, some trouble must be taken to bring it into good tilth, and to enable the plants to send down their roots, which, in loose rich scrub or deep volcanic soils, extend downwards to a depth of 20 or 30 feet. On the latter soils there is no more trouble in growing lucerne than in growing a crop of oats, provided that sowing takes place at a season when the young plants will not be choked by weeds. Once they are well established they will be safe, as they are able to smother all weeds. In the shallower soils, however, the work of laying down a lucerne field so that it may be permanent is more troublesome. First, a furrow should be turned in the usual way by one plough. Then a second plough, without the mould-board, should be employed to break up the subsoil to a depth of at least 12 inches; but the subsoil must only be loosened, not brought to the surface. Now, the soil must be reduced to a very fine tilth, as lucerne seeds are very small, as many as 12,000 being in a single ounce, and most would fail to germinate if buried under heavy clods of soil. Lucerne will continue to give good crops for ten years if the soil is suitable to it. Indeed, it will continue to yield crops for a much longer time if, when the field shows signs of deteriorating, the plough is run over it, splitting the crowns of the plant, and a little seed be afterwards scattered and harrowed in.

When the land has been properly prepared, it will be for the farmer to consider whether he will sow broadcast or in drills. We hold with drilling the seed, because, no matter how well the soil has been prepared, and summer weeds have disappeared, some weeds, particularly sow-thistles, are sure to dispute the ground with the lucerne, and where the seed has been sown broadcast there is great difficulty, if not impossibility, in getting rid of them, whereas when sown in drills it is an easy matter to keep the intervening spaces clean by hoeing. This can be done when the plants are about 3 inches high, and very little damage will be done to them by a horse passing between the drills. Such clearing may be continued when necessary until the plants are 8 inches high, when they will be quite able to hold their own. People differ as to the quantity of seed required per acre. If, however, we average the experience of practical lucerne-growers, we find that the general opinion is that 10 lb. of seed are ample when broadcast, and from 5 lb. to 6 lb. when sown in drills with a drilling machine. The drills should be about 12 inches apart. In covering the seed, the rule should be borne in mind that small seeds should only be covered to a depth equal to their own diameter, but from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch has been found to give excellent results in the case of lucerne seed. The covering may be done by means of a light wooden harrow attached to the drill. We have also used a brush-harrow with very good effect. As soon after sowing as possible, the field should be rolled. If the soil has been properly managed, smoothed by the harrow after sowing, and then rolled, there will be a perfectly even field, a great advantage when the mowing machine comes into play. The more lucerne is cultivated, the better it will grow, and it is a difficult matter to over-cultivate it. The spring-tooth or disc harrow should be run over it after each crop is taken off, or as the crop comes off, six or eight times a year, and as it might not be convenient to cultivate so often, the work should always be done in the spring.

The best time to cut lucerne for hay is just when the blossom is showing. If allowed to get too far advanced in the flowering stage, its best properties as hay fodder will be lost. If grown for seed, the plants should be at least three years old. The time to cut for seed is when the lower pods are quite ripe and the upper ones turning brown. The lucerne for seed, if stacked, must be perfectly dry, but it is better to thresh straight from the field without stacking.

The ordinary wheat-threshing machine will answer the purpose well. The yield of seed per acre is variously estimated at from 50 to 400 per acre, depending, of course, upon all the usual chances of good seed, climate, season, aspect, cultivation, &c.

Lucerne intended for hay should be cured as rapidly as possible, and should not be cut, if there are signs of long-continued rain. If exposed to heavy rain, the leaves drop off and the hay is afterwards practically valueless. Of course, if the farmer has a silo, and sees no chance of getting a hay crop, he can save the whole of it by putting it into the silo, when it will come in as a good stand-by for cattle feed.

Sometimes the land becomes what is known as *lucerne sick*. This is owing to the land having been too long under lucerne. In such a case a two-years' rest is needed. The land may either be fallowed for one season, and a crop of potatoes or corn taken off in the following season, or green fallow the land for two years, taking one crop of some cereal each year.

Some thirty-five years ago a disease, or rather a harmful parasite, of the lucerne plant was introduced from New South Wales. This was the "Dodder" *(Cuscuta australis)*. It is a kind of hair-like vine which creeps up the lucerne stems, twines round them, and, by means of small suckers or rootlets, feeds on the sap of the plant. If allowed to spread, the field rapidly assumes the appearance of having been attacked by ringworm. The main root of the dodder dies, but its tendrils spread in a circular form, leaving the lucerne in great yellow circles. The remedy is at once to dig out the lucerne so affected the moment it is noticed. Great care is required in removing it, as the least particle of dodder, if dropped elsewhere in the field, will grow. The bare patches should be sprayed with sulphate of iron. The solution should contain as much sulphate as a cask of water will take up. The lucerne and dodder should be removed and burnt, or even burnt on the spot, which is then to be watered with the liquid. Mr. J. Whitely, of Wycarbah, recommends first to destroy the lucerne and dodder by fire, and then to mulch the spot heavily (say 4 to 6 inches) with dry grass. This effectually chokes the dodder, but the lucerne will grow through it. When required to be mown, the mulch should be removed. It is not at all necessary by adopting this plan to dig up the lucerne roots.

The cost of preparing the land, of seed, and sowing will reach about 25s. per acre, and no further expense is entailed, once the field is established, for several years.

GRAPE VINE CUTTINGS.

In the course of a couple of months, vignerons will be pruning their vines, and those who propose extending their vineyards or laying down new ones will be afforded the opportunity of obtaining many valuable varieties from the State farms at Westbrook and Biggenden. All the vines in the farm vineyards have been carefully selected either for their value as table grapes or for wine-making. The list of varieties is too long to be given here in its entirety, but vignerons with a knowledge of the particular wine or table grape they require may, with confidence, leave their orders in the hands of the managers of the above State farms, with the certainty that the cuttings are all true to name. It should, however, be noted that Black Monnukka and Ladies' Fingers cannot be supplied from Westbrook; but Monnukka appears in the Biggenden list as available.

Attention is drawn to an advertisement on another page in which some of the varieties are named and prices and conditions given.

Dairying.

CALF-FEEDING EXPERIMENTS.

By JOHN MAHON, Principal, Queensland Agricultural College.

The calves selected for the experiments were a good thriving lot, that took their food freely. They comprised Grade Holsteins, Shorthorns, and Ayrshire-Shorthorns, divided so that each class was represented in the two groups. The calves were all weighed at the commencement of the experiment, and again each Saturday, one hour after feeding. They had access to water, and were supplied with rock salt. The paddock in which they were grazed was well grassed with couch grass.

Tabular record of weekly weights of calves fed on cod liver oil:—

No. of Calf.	Weight at Commencement.	Weight in Pounds at End of—						Total Gain at End of 6th Week.
		1st Week.	2nd Week.	3rd Week.	4th Week.	5th Week.	6th Week.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	113	122	129	140	153	164	172	59
2	164	168	179	198	210	218	242	78
3	113	133	145	155	170	184	190	77
4	248	271	285	308	326	339	352	104
Totals	638	694	738	801	859	905	956	318

According to the above table, the average daily increase of each calf was 1.88 lb. The quantity of cod liver oil to be fed to each calf was measured, and it was added to the skimmed milk just previous to the animal being fed; each calf was fed separately. The daily ration for each calf was 2 oz. of oil and 3 gallons of skimmed milk. As the cold liver oil rises quickly to the surface, the milk and oil should be well stirred when the calf commences to take its food, so as to distribute the oil. It is not advisable to "pool" the milk and oil for a number of calves, the better plan being to add the allowance of oil to the milk intended for each animal. It was noticeable at the commencement of the experiment that the calves exhibited a dislike for the oil, but, after the first day, they took it readily. For the first two days the oil food acted as a laxative, but after this normal conditions prevailed throughout the period covered by the experiment.

Tabular record of weekly weights of calves fed on mixed ration:—

No. of Calf.	Weight at Commencement.	Weight in Pounds at End of—						Total Gain at End of 6th Week.
		1st Week.	2nd Week.	3rd Week.	4th Week.	5th Week.	6th Week.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	220	235	246	261	277	290	304	84
2	185	193	201	216	237	242	254	69
3	90	92	110	120	131	138	145	55
4	153	160	176	189	202	214	224	71
	648	680	733	786	847	884	927	279

The average daily increase of each calf was 1.66 lb.

The mixed daily ration for each calf was made up as follows:—

Pollard	10 oz.	Molasses	2 oz.
Linseed meal ...	3 oz.	Skimmed milk ...	3 gallons

The linseed meal was mixed with water and boiled to form a jelly. The pollard was mixed with water, then boiled for forty or fifty minutes; it was then added, together with the linseed jelly and the molasses, to the skimmed milk. This ration was taken readily by the calves, and no scouring occurred.

The calves fed on skimmed milk to which cod liver oil had been added made a daily gain of 1.88 lb. per head, while those fed on the mixed ration showed a gain of 1.66 lb. per calf, a result favouring the use of cod liver oil. The appearance of the calves was satisfactory, both sets being in a good thriving condition, and entirely free from a "poddy" appearance. The use of cod liver oil facilitates the feeding of calves, and also lessens the danger of scouring which frequently occurs when improperly prepared or unsuitable food is fed to calves.

THE DAIRY PRODUCE ACT OF QUEENSLAND, 1904.

INSTRUCTION TO DAIRYMEN.

INTRODUCTION.

The tremendous development of the dairying industry in various countries of the world during the past ten years, particularly in its relation to the export trade, has led to Queensland entering into competition for a share of the profits of one of the most remunerative branches of Agriculture.

As a field for the cheap production of the raw material in almost unlimited quantities, Queensland enjoys many advantages over countries at present successfully competing in the world's markets. Anyone acquainted with the conditions obtaining in this State, the vast areas of land suitable for milk production, the mildness of our winters, &c., must admit that the possibilities of Queensland in the direction indicated are enormous.

The two disadvantages—the heat of a portion of the summer, and the distance separating us from the chief markets of the world—long held as insurmountable obstacles to Queensland's success in the export of dairy produce, have been practically overcome by refrigeration in the various stages of the product from the supplier to the consumer. Other countries more favourably situated in the above-mentioned respects have found it necessary to adopt refrigeration; and it is, therefore, in Queensland's case all the more imperative that this triumph in the treatment of perishable produce should be availed of to the fullest extent.

Without refrigeration or some hitherto undiscovered substitute, the landing of butter in a condition to compete against the average imported article would be an impossibility.

The experience of most countries that have passed the initial stages of exporting dairy produce has shown that to permanently establish the industry some system of Government supervision is absolutely necessary.

The Dairy Produce Act of Queensland was passed in 1904 to become law on the first day of April, 1905. The chief reasons which led to the passing of the measure are as follows:—

The education of the dairymen by the appointment of inspectors, men specially selected to give instruction when required, thereby saving producers much useless expenditure and misdirected energy.

To place the inspectors in a position to do their duty regardless of the influence or social standing of people who may be guilty of breaches of the Act.

That the low prices obtained for Queensland butter in the London market, year after year, as compared with Victoria and New Zealand, are sufficient proof that legislation was necessary to place the Queensland product on an equal footing with that from other countries, where the conditions for producing first-class butter are no better than they are here.

In short, the object in view is to encourage the development of the dairying industry by protecting those people who, by cleanliness from a dairy point of

view, diligence, and honesty, are doing their best to make the industry under review one of the principal assets of the State, from those who, through wantonness or carelessness, ignore the foregoing particulars; to remove as far as possible the drudgery attendant on the production of the raw material under the system existing hitherto; and to advertise to the world the fact that the dairy produce of Queensland from its source is above suspicion, and can claim to be placed alongside the best produce from any other country.

In reviewing the pamphlet, it is to be hoped that dairymen will find the instructions useful as a guide to them in fulfilling the requirements of the Act.

CONTAMINATION OF DAIRY PRODUCE AND ITS CAUSES.

The success of the dairying industry largely depends upon the milk and cream suppliers; and they should use their combined efforts to minimise what this pamphlet will endeavour to show are the chief causes of failure in the manufacture of choice butter and cheese. It is an axiom that the situation of dairy factories, equipment, and intelligence and proficiency of employees are of little avail when the raw material is in a defective condition. It must be admitted, however, that some circumstances and conditions, climatic and otherwise, are adverse to the production of good produce, which the Queensland farmer is not responsible for. The reasons for greater care in the handling of milk and cream by the suppliers are therefore increased.

The prevalence of weeds having a taint-producing effect in milk is very common during some months of the year, and it may happen that certain taints in butter and cheese which are attributed to bacterial life are caused by plants in the food of the cow. From lack of knowledge of the injurious changes affecting milk and cream, the owners of dairies neglect to enforce preventive means of reducing the sources responsible for the contamination. It may be inquired, "What can we do to improve the keeping properties of milk and cream before it leaves the farm?"

The answer is, "Keep out foreign matter, adopt aeration, and have every place clean and sanitary."

In dealing with the unwelcome changes which are recognised as the greatest and most costly evils affecting the success of factory dairying, a few words will be of interest to suppliers. So alarming have those evils been in past years that, were it possible to give a yearly estimate of the avoidable injury to milk and cream, it would cause much reflection on past methods of handling the raw produce of the farm. The question may be asked:

"Why have we neglected so serious a matter?" The principal answer is, "Because dairymen have all along been too conservative in the pursuit of dairying, believing that old practices and principles were good enough for repetition at a period when producers in other countries are using every endeavour to establish success in the butter markets of the world. It is forgotten that the result of competitive struggles has educated consumers of dairy produce to exercise a keen palate, and, until the confidence of patrons at home and abroad is won, the success producers are striving to attain will be seriously impeded."

A second reason has been a want of opportunities whereby those in the industry could be made familiar with modern methods and teachings; but it will be a serious fault if the dairy farmer of to-day neglects to make use of the assistance which is placed at his disposal in so many ways. Let it be clearly understood that the prosperity of the industry rests with the factory supplier—who is chiefly responsible for the flavour or quality of the produce.

Where Injurious Bacteria are Found.

Germ life is found wherever organic matter and moisture exist. Some organisms impart to dairy produce special offensive flavours. Others are not injurious when kept in check, being otherwise useful in what they manufacture, but they prepare the way for bacteria that are productive of taint. These germs find a suitable environment for their multiplying power

in insanitary milking-yards, on the teats and udder of the cow, in the milk and separating rooms, and in utensils which are not effectively cleansed and scalded. Germs accompany the particles of dirt in enormous numbers, and in milk they multiply with such rapidity that taints are produced in the course of a few hours. We do not so much fear the varieties that turn the milk acid, but what we dread are those that make the milk and cream stale, bitter, and otherwise unsuited to the manufacture of good butter and cheese.

DIRTY UDDERS AND UNCLEAN MILKING.

Many people disbelieve in what science is labouring to teach the dairymen on the subject of germ life. To illustrate the presence of micro-organisms in and around the dairy, and their influence on the flavour and keeping properties of produce, Mr. G. S. Thomson, Government Dairy Expert, conducted a series of comprehensive experiments. They were carried out in the following manner:—A number of sterile (germ free) glass tubes and plates containing bacterial food were prepared, and, in company with a prominent sanitary inspector in a southern city, he proceeded to a dairy farm. On their arrival the owner was busily engaged milking the cows, and to all appearances a good opportunity of securing descriptive bacteriological specimens was in evidence from the uncleanly condition of the cows and milker. (A and B are cultures of germs from milker's hands.) Selecting a cow, the writer proceeded to dust her udder free from the large particles of dirt and adhering pieces of straw before exposing the plates of transparent germ food. When the udder appeared somewhat clean, one of the plates was held immediately under it for 40 seconds, and after a lapse of 10 seconds a second plate was exposed to the finer particles of dust for one minute. The germs were cultivated, and, two days after sowing, both plates were photographed.

The first showed distinctly a number of hairs which had fallen from the cow's udder, and along their lines an accumulation of bacterial life was seen. Not only were the teats and udders of the cows dirty at this particular dairy, but the milker had acquired the abominable practice of dipping the hands into the milk during the process of milking. In other words, the teats of the cow were undergoing washing, which caused serious contamination of the milk supply, and considerably reduced its keeping qualities. To prove the danger of this disgusting practice, one of the sterile tubes was filled with a quantity of milk from a pail in the yard, and which represented the yield from one cow. A second tube was partly filled direct from another cow by the milker while engaged in stripping. One drop of milk from each tube was sown in plates and the colonies cultivated, showing the extraordinary number of germs in the samples. The strippings were unusually fertile, which is evidence that the contamination came from the milker's hands.

A convincing evidence of contamination in milk is shown in practice when suppliers' cans are examined at factories on delivery of the milk supply. It frequently occurs that the surface of the milk in the cans is discoloured with particles of dirt, pieces of straw, hairs, and other foreign matter; and further proof is found in the collection of dirt in the milk-strainer.

From the foregoing, readers will be convinced as to how milk is injured during milking, and must admit that to a great extent this can be avoided by introducing a system of rubbing the udders of the cows with a damp cloth. It is recommended to wash the udders when damping is ineffectual, but the teats should certainly be washed and dried before milking commences.

Milk in the udder of a healthy cow is said to be free from germ life (sterile). The first milk or washing of the teat ducts, however, may contain many bacteria, the middle milking fewer in number, and the last milking none.

ACID MILK.

In using the word "contamination" it does not apply scientifically to acid milk. In Cheddar cheese-making a degree of acidity is essential to the manufacture of a good cheese; but it frequently happens that milk delivered to the factories in the above condition is not free from taint.

The following experiment was conducted to show the value of care and aeration in the treatment of milk compared with want of attention in this particular duty. At a dairy farm a cow was milked in a careful manner, the milk aerated by means of a common Lawrence cooler, and run into a can previously scalded and cooled down. Immediately after aeration the can was covered with a damp muslin cloth, and removed into a clean dairy, where the milk was allowed to become acid. To show that injurious germs were not abundant in milk treated in such a beneficial manner, a plate-culture was made, and the colonies microscopically examined. This showed the organism growing in numerous little specks. They all belong to the lactic group, which flourish in ripe milk and cream, and it is principally by their action the good flavours in both cheese and butter are produced. To give an illustration of an opposite kind, a quantity of milk was taken from a supplier's can on a Monday morning. The milk was not acid to the taste, although it was otherwise unpleasant. A plate was prepared, and a drop of the milk cultivated, with the result as shown in mould, which proves that the fungus may be found in the milk as well as in the cream.

CREAM.

The question of cream interests the butter-maker most, as the quality of the butter which he manufactures depends upon the bacteriological purity of the cream churned. It must not be forgotten that the value of cream is greatly dependent upon the condition of the milk when separated, and that tainted milk will not produce a delicate aroma in butter.

In separating milk every precaution should be taken to have the working parts of the separator perfectly clean. Take the machine to pieces at the close of each operation, and wash and scald the bowl and its accessories; put the parts together immediately before separating.

In many places it is customary while separating to collect the cream into 10-gallon tins before sending to the factory. This practice is very often accompanied by deterioration in the cream and loss in the quantity and quality of the butter manufactured. The dangers are increased when farms are situated at inconvenient distances from stations and factories, and when the number of cows kept necessitates many collections to fill a can. In such instances, cream should be sent to the factories as often as it is convenient.

Again, it may be mentioned that the flavour of butter is controlled by the flavour of the cream which is produced by the acid-forming organisms. Tainted cream, as already pointed out, follows the activity of the injurious germs.

STERILISED ACID AND TAINTED CREAM.

When cream is carefully collected and ripened, the acid-producing organisms take possession of the cream and kill other germs of a hurtful kind. In Denmark over 98 per cent. of the factories pasteurise the cream, and then add pure cultures of germs to produce ripeness. By this method the Danes have obtained uniformity in the general quality of their butter, and to this they owe much for their renowned position in the home markets. Milk for cheese-making is also artificially ripened, and the results have fully justified the use of starters.

Colonies from cream ripened with a culture were examined, and no trace of any injurious organism was found. When cream is separated into one can twice daily, and this continued for a number of days, no longer do we find a predominance of the ripening organisms which inhabit every clean and well-kept dairy, but many injurious ones make their presence felt by producing a taint.

Complaints were made of the tainted condition of the cream obtained in a town factory, and the examination showed that weeds were not accountable for the bad flavours.

INSANITARY MILK AND CREAM ROOMS.

Places used for the purpose of storing milk and cream often have an abundance of floating dirt in the air. When cans are left unprotected, the dirt and moulds fall into the milk and cream with a more or less injurious effect. Separating and cream-ripening are done in the same room, and often the place is utilised for the storing of butcher's meat, vegetables, &c.

A plate exposed to the air of a badly kept room for ten minutes showed that the colonies of germs are numerous, and mould in wavy lines was present over the greatest portion of the illustration. It will be readily gathered how easily export butter and cheese become mouldy and injured by bacteria when such conditions are permitted to exist.

Impure water should never be used for washing butter. Attention should therefore be given to the sources of all factory water supplies.

COLOSTRUM.

"Colostrum" or "beastings" is the name applied to the milk secreted by the cow immediately before and for some time after parturition. The composition of colostrum usually changes quickly after the birth of the calf; but, before the milk is suitable for butter-making, from six to fourteen days must elapse, and in some cases a longer period has been found necessary. The first milk should be given to the calf, as it contains a medicinal property, having a desirable action on the intestines. The colour of colostrum is very objectionable; but that is not its worst feature. The flavour is so pungent that half a gallon of cream from colostrum milk is sufficient to destroy the aroma of butter manufactured from ten gallons of sound cream. The addition of so small a quantity effecting such a change will illustrate what the result would be were three gallons added to an ordinary churning.

The following is the analysis of colostrum and normal milk:—

	Colostrum (Engling).	Normal Milk.
Water	71.69	87.5
Fat	3.37	3.5
Casein	4.83	3.5
Albumen	15.85	0.25
Sugar	2.45	4·5
Ash	1.78	0.75

For cheese-making, the dangers are greater, and in no case should milk be sent to a factory until the flavour has disappeared. Decomposition in cheese is hastened by colostrum.

In Denmark the visitor cannot fail to be impressed with the perfect cleanliness of the buildings, machinery, and utensils in use at the various dairy factories. The air in the rooms have a feeling of purity and sweetness, and everywhere one finds illustrations of the factory-worker's sense of responsibility of the dangers of germ life, and how to successfully enforce preventive measures against the possibilities of bad odours in the factory.

The very wide application of lime water to utensils and hot lime to the inner walls of the buildings is an important factor in the manager's education. The question arises: If the experience of the Danes goes to prove that taints have quickly disappeared in their cold climate since the uses of lime became general, why should there not be a much greater reason to adopt the system in a climate of far higher temperatures, and with factories and farms less favourably situated to ensure freedom from hurtful smells? It is questionable whether dairy farm utensils, butter-workers, pounders, and churns in Queensland possess that sweetness of smell which is so desirable in successful butter-making, and so characteristic of every item in the equipment of a Danish milk farm and factory.

(To be continued.)

Copies of "*The Dairy Produce Act of* 1904" can be obtained from the Government Printer, William street, Brisbane, on the payment of 6d. per copy; postage of 1d. per copy to be added.

THE DAIRY PRODUCE ACT.

Amongst the provisions of the Dairy Produce Act shortly to come into operation are some that suburban dairymen will do well to note. There are dairies in the suburbs of Brisbane where from 4 to 7 cows are milked daily, and where it will be impossible for the owners to comply with the Act in many respects. Some of these little dairies are located on two, three, or four 16-perch allotments. Take a 40-perch allotment—that is, one-quarter of an acre, or about 105 feet square. A portion of this land is taken up by a dwelling and outhouses, milking-shed, feed-room, stable, and cart-shed, and on some allotments of this size a patch of millet or green maize for feed is grown. Pigsties and manure heaps must be at a distance of at least 150 feet from the milk-room, an impossibility on such small allotments. As the Act cannot be complied with in such cases, and absolute cleanliness cannot otherwise be ensured, these little dairies must cease to exist, and in the interests of health it is perhaps as well that dairies should be removed from the centres of population. Doubtless the owners will feel it a hardship, but if an Act is passed, and so become law, individual hardships cannot be considered in view of the advantages to the community as a whole. Following are some of the provisions of the Dairy Act:—

Premises used as a dairy shall be registered between the 1st April and the 1st July, 1905, and renewed on or before the 14th of April in each year.

The annual fee payable for registration is to be based on the average number of cows milked during the month of March; or, in the case of a first registration, on the number of cows milked on the day of application; if the number exceeds five, the fee is at a rate of 3d. each cow in milk, the minimum fee being 2s. 6d.

The separating or milk room must be exclusively used for separating, storing of cream, and utensils. It is not permitted to use this room for any purposes other than separating, nor of storing anything in the room other than milk or cream. The room must be so constructed as to be well ventilated and capable of being thoroughly cleansed. The apertures taking the place of windows should be provided with gauze wire netting. The room must be limewashed at least every four months.

The separating or milk room may be erected as a "lean-to," but a detached building is preferable.

Every creamery—that is, a building or place to which milk is brought from more than one dairy farm—must have impervious watertight floors—cement is preferable—must be well ventilated, effectively drained, and shall be thoroughly disinfected as often as may be prescribed.

Every cheese-making room or maturing-room shall be well ventilated, and all whey removed at a distance from the building at least 100 feet.

Pigsties, manure heaps, must be at a distance of at least 150 feet from separating or milk room, or factory, unless under special circumstances, which require that the permission of the Minister shall be obtained before departing from the required distance.

Fowlhouses must be at least 50 feet from the separating or milk room, or factory, unless under special circumstances, which require that the special permission of the Minister shall be obtained before departing from the required distance.

No drainage from piggery or stockyard shall be permitted to flow within 150 feet of the separating, milk room, or factory, unless in a drain properly cemented.

No cesspit shall be permitted to exist upon any dairy premises.

The milking-yard and milking-shed must be kept clean. If the floor of the milking-shed is of such a nature as cannot be kept firm and clean, it is desirable such shed be floored with hardwood and cracks caulked, or, preferably, the floor might be cemented.

Dairy produce of any kind intended for sale must not be placed, even for a short time, in any room that is used for domestic purposes of any kind.

Immediately after each milking the droppings must be swept up and removed to the manure heap.

The separator and all utensils must be well scalded after each use.

HOW PIGS MULTIPLY.

The *Nebraska Farmer* explains how a pig-breeder commencing with a small sow can raise over 1,100 pigs in four years.

Not long since two gentlemen were driving by the home of a successful farmer. As they passed the barn lots a thrifty-looking sow pig crossed the road before them. They remarked about the beauty of the little animal, and the older of the two said:—"You may not believe me, but I can take that very little sow and in four years with her increase buy the best 80 acres there is in this neighbourhood, and have enough hogs left to stock up the farm and pay a good share of the expense in their keeping."

At first thought the statement does not seem possible, but a little figuring will prove that it is not far from the truth.

We will suppose that the sow and all her female increases will farrow for the first time when they are a year old, and will give birth to a litter every six months thereafter; and that each litter will average six pigs—three males and, with the mother, four females. In eighteen months she has a second litter. This brings the total up to seven sows and six males. After two years have gone this sow has her third litter, and each of the three sows of her first litter also farrow. This brings our number up to 40 females and 39 males. In three years the sows of her first, second, and third litters will farrow, and, in addition, the nine that were born, three each to the three of her first litter. This increases the number to 97 females and 96 males. Thus it goes on in progression till the end of four years we have a total of 598 females and 597 males—hogs enough to buy a good-sized farm.

The above reminds us of the well-known fable of the French poet La Fontaine, which describes how a young girl, carrying a milk pot on her head, reckons from the sale of the milk to buy a pen of fowls, which would produce so many eggs and chickens that their produce would soon enable her to purchase a cow, and the cow would, by her milk and progeny, lead eventually to a farm. Delighted with the prospect, she forgot the milk pot on her head, jumps for joy, and then—good-bye chickens, cows, and farm. Arithmetical progression is magnificent in theory, but we doubt if any Queensland pig-breeder has yet made £1,400 in four years, starting with a single boar and sow, not to speak of the return after six years. Queen Cross and Mount Morgan shares would pale before pig-breeding at this rate.

ORANGES FOR AUSTRALIA.

The cultivation of oranges in this and in the Southern States has so greatly extended that one would imagine there would be as little need to import oranges from America as coals from Newcastle. Yet oranges are frequently imported from America. In 1903, Queensland produced 1,150,514 dozen oranges; New South Wales, in 1904, 7,837,944 dozen oranges; South Australia, about 814,000 dozen oranges; Victoria, about 357,000; total, 10,159,458 dozen—a total sufficient to give every man, woman, and child in Australia about 3 dozen oranges each. Yet the *Pacific Fruit World* says:—The Azusa-Covino-Glendora Fruit Exchange lately shipped a car of fancy Azusa and Glendora navels to San Francisco, from which point they will go by fast steamer to Australia. This is the first shipment of fruit from this locality to the Antipodes.

The Horse.

HORSES FOR EXPORT.

By P. R. GORDON.

The events of the two past years have shown that there is a ready and payable foreign market for our horse stock, provided that the required classes are bred here. It is not intended in this short article to treat of the various breeds of horses, except in so far as they may be used in the raising of a description of horse best suited to the Indian and other markets. That one or other of the heavy draught breeds will have to be judiciously used for a time in the breeding of gunners (wheelers and leaders) and for heavy cavalry is indisputable. The three heavy draught breeds at present available here are the English Shire, the Clydesdale, and the Suffolk. (We have not yet here the Percheron, so much valued in America.) Of the three breeds above-named, the Shire may be discounted. We have very few of that breed in Queensland, and, indeed, they are very scarce in the Commonwealth and New Zealand. For heavy, slow work, such as brewers' drays, they are in great favour in London, but are not sufficiently active for any of the classes required for an export trade. The Clydesdale has the advantage of fine slanting shoulders, solid bone, and magnificent feet. Indeed, Scotchmen have for very many years set great value on the feet, and, with the single exception of the desert Arab, no other breed can boast of better formed and sounder feet than the Clydesdale. In an article contributed by me a number of years ago to the *Live Stock Journal Almanac*, at the request of the proprietors of that paper, on "English Live Stock at the Antipodes," I ventured to hazard the opinion that the Suffolk would be the future heavy draught horse of Australia, and I arrived at that opinion in defiance of my preconceit of the Clydesdale, the horse *par excellence* of my native country. The evidence I have since had, ocular and otherwise, of the tractability, temperament, activity, and the kindness with which they take to the collar has convinced me of the correctness of my former estimate. I have now very little doubt that the Suffolk will play a most important part in the building up of the description of horses best suited for export. One of his recommendations is his clean legs, free from the unsightly heavy fringe of the Clydesdale. This may be called a mere fanciful point, but fancy goes a long way in the horse trade. For a time his light-chestnut colour and light mane and tail were certainly objectionable, but the light points have now been bred out, and the body colour of the present-day Suffolk is much richer than formerly. It has been contended by some that a good class of sturdy light harness horses could be evolved out of our present studs without resorting to a sudden crop of a heavy draught breed. There are no doubt a few herds of horses that have been carefully bred, and the mares prevented from running to weediness, but they are the exception. By far the greater proportion of our mares are too light in the bone and too weedy to beget horses of the description that recent foreign buyers have preferred and are ready to pay remunerative prices for. It is therefore essentially necessary, in order to lay the foundation for a stouter class of horses, that an infusion of draught blood be introduced into our bush studs. To breed up a description of horses suitable for the Indian and other foreign markets must be a question of time. A sudden crop of either a Suffolk or Clydesdale on our light mares would, in a large majority of cases, fail to produce the description of horse required for either light or heavy cavalry, although in most cases they would be suitable as gunners. The mares, the progeny of that crop, however, particularly the Suffolk crop, if mated with powerful thoroughbred sires—not mere "galloping machines," as some have contemptuously dubbed the race-horses—should produce

such a description of horse as has ever been preferred for the Indian market. The description of thoroughbred horse to be selected for that purpose ought to be of the type selected and subsidised by the English Government to travel in the various counties. Some breeders have expressed the opinion that the type of sire to be selected should be the English hackney, of which Sir Walter Gilbey and Mr. Burdett are such strong advocates. On the other hand, the Irish horse-breeders do not, as a rule, favour the English hackney, preferring the use of a stout thoroughbred. At this distance from the old country it would be difficult to form an opinion on such a subject; but this much will be conceded that, taken as a whole, the Irish hackneys and hunters are held in as much esteem, if not more so, than the same classes of horses in England.

SISAL HEMP IN YUCATAN.

The *Consular Report* on the trade of Vera Cruz for 1903 contains the following interesting notes on the cultivation of sisal hemp in Yucatan:—

Henequen, or sial hemp, is grown in Yucatan, in this consular district, at an elevation of from 28 to 100 feet above sea-level, on a strip of country generally calculated to be about 40 miles from the sea inwards, in which zone the temperature ranges from 45 degrees to 100 degrees Fahr., with a mean of about 85 degrees. The plant from which this fibre is produced is of the family of the American Agave. It flourishes on arid land where the soil is very thin, resulting in the strength of the plant being driven into the leaves instead of the roots, while the roots appear to run along the surface, and from these the shoots are produced and in turn planted. It is very hardy, producing the whole year round, and from the time of first giving fibre, when about six years old, continues producing leaves for from twelve to eighteen years.

It may be taken that 1,000 leaves at maturity give from 40 to 60 lb. of fibre, and on the cutting of these the life of the plant depends, for, if they are not cut, the plant will pole before time, and once poled the hemp becomes dry, if not entirely useless. The time for cutting the leaves is when they are at right-angles to the stem. Weeding is necessary every year, about a month before the rainy season begins, so that the plants may have all the advantage of the rain, and at the same time new shoots are planted. Shoots are cut from the plants at from two to three years of age. The purchaser, if wishing these for use out of the State, would have to pay about 80 dollars (£16) per 1,000 in addition to the cost of cutting and other charges, as well as a heavy export duty. Purchasers have been known to wonder why they would not grow, not being aware that the grower has been known to boil the shoots to prevent competition in other lands. The leaves are, when ready for cutting, about 5 feet long. After they are cut, the thorns on both edges and the hard points or needles are removed, the leaf then being passed through a cleaning machine, and the fibre when extracted is dried and bleached in the sun. It is then ready for export, and put up in bales of about 160 lb. In 1884, the State of Yucatan exported 233,311 bales; in 1894, 373,833 bales; and in 1903, 590,430 bales.*

The principal purpose for which the hemp is used is the manufacture of rope and binder twine. It is generally mixed with some Manila, which is longer and somewhat better. Some of the hemp is shipped to Europe, but the great bulk of it is sold in the United States. The amount exported during 1903 was taken by various countries, as follows:—United States, 575,167 bales; Cuba, 8,066; United Kingdom, 4,286; Canada, 1,200; France, Spain, Germany, and Belgium, 1,711.

* In 1904 the export exceeded 600,000 bales.—Ed. *Q.A.J.*

The Orchard.

NEW VARIETY OF ORANGE.

The *Pacific Fruit World* says:—An orange-tree that will thrive in latitudes hundreds of miles north of Florida has just been developed by the plant experts of the Department of Agriculture at Washington, D.C. It is the result of crossing a Japanese tree with the best Florida varieties. The new variety, it is claimed, will live at a temperature 6 degrees below zero, although it will not bear fruit. The planters of Florida suffered great loss on account of frost, losing not only a year's crop occasionally, but the trees as well. With the introduction of the Japanese-Florida variety, the trees may be saved, even when the climatic conditions are such as to prevent bearing.

In April, 1903, we published an article in the *Journal* entitled, "The Evolution of an Orange that will Stand Zero." The article described how Mr. J. L. Norman, of the Hillside Nursery, Marshville, Louisiana, succeeded in producing an orange which can stand such an Arctic degree of cold as zero. The fruit was sent to a New Orleans journal, and that paper said that they measured on an average 6½ inches in circumference. They had fewer seeds than the ordinary sweet orange, and were of unusually fine flavour. Mr. Norman produced it by hybridisation with the hardy Japanese hedge orange—the *Citrus trifoliata*—which has for years been used in Florida by the more progressive orangemen as stock on which to bud finer varieties.

To this we added that there was nothing improbable in this account of a frost-resisting orange, as, at Texas, on the Southern border of Queensland, there are a number of fine, healthy orange-trees bearing good fruit. These trees have repeatedly gone through winters when the thermometer fell to 22 degrees Fahr., and in one year the mercury fell to 18 degrees, without any damage to the trees.

VINEGAR FROM APPLES.

The codlin moth, gales of wind, and hailstorms effect considerable destruction in apple orchards, and the damaged fruit is either left carelessly to rot and breed more insect pests, or is buried or fed to pigs. There is a better way to utilise these damaged apples, and that is, to turn them into vinegar. In answer to a correspondent, *Garden and Field* gives the following directions for making apple vinegar:—

In eastern America, where wine vinegar is almost unknown, good cider vinegar is considered the best of vinegar, but its quality depends on how it is made, and the quality of the cider from which it is made. This in turn depends on the character of the apples from which the cider is made.

The strength of the vinegar depends on the alcoholic strength of the cider, and that in turn depends on the sweetness or percentage of sugar in the apples.

To make vinegar you must first make cider. To do this you must crush your apples, press out the juice, and ferment it into cider. This cider can then be turned into vinegar in several ways.

The residue, or apple pomace, mixed with pollard, crushed peas, or other grain, is splendid food for pigs, or mixed with chaff or bran is equally good for cows. It is really better than the whole apple pulp, because the excess of apple acid and water is removed, but enough is left to act as an agreeable tonic to the animal.

To make the cider, the apples must be put through some form of crusher or grinder, and the finer they are ground or crushed the more juice will they yield. Having crushed the apples, the pulp must be put in bags and the juice

extracted by pressure. There are special machines for pulping apples, but you will probably be able to devise some rough-and-ready means of dealing with your small lot, especially as the extracting of the whole of the juice is not an important matter with you, and the residue can be profitably used for pigs or cows.

To press out the juice, a simple form of level press is made by inserting the end of a stout sapling into a stump, and either weighting the other end or fixing a windlass and pulley to draw it down. By the latter means an immense pressure can be obtained. The longer the lever, the greater the pressure.

Having obtained the juice, place it in open tubs or casks to ferment, which it will soon do. The fermentation should continue until the whole of the sugar is converted into alcohol, and the cider is what is called dry. If you desire, you can cask some of this up for drinking, and keep the air away; but for vinegar, rack it off and expose it to the air as much as possible.

To place the cider in casks in the cellar or in a shed with the bunghole open, but covered with a bit of wire gauze, will produce vinegar in time; but it is a tedious process, whereas either of the following methods will hasten the process and prevent risk of its going bad:—

Take a vinegar cask, lay it on its side in a warm shed, and place in it a gallon of the strongest vinegar you can procure, such as Seppelt's best white vinegar. Mix with it a gallon of your cider, and let it remain two or three days, and then add daily a gallon of cider until the cask is two-thirds full. You can, of course, have as many casks going as you like. When the cask is two-thirds full, stir it up and let it remain a few days until by taste you consider it is completely acidified. Now draw off the clear vinegar into another cask, and start again, adding a gallon a day to the residue. The filled casks should then be put in the open, in the shade of a tree, to mature for a few weeks, when you should have excellent vinegar.

If you have a cider-mill and desire to make vinegar on a large scale, you can procure three casks, take out the heads, and bore gimlet holes in the bottoms. Fill the casks to within a few inches of the top, fully but loosely, with clean, hard straw from which the flag is removed as much as possible, or with small vine twigs. Put in a false head on top of the straw or twigs, and bore small gimlet holes similar to the bottom. Place the cask on a wooden tray, but raised an inch above it, so that the air can pass freely under and up through the holes, and through the straw and out at the top.

Three casks should be placed one above another, so that the liquid from the upper tray will fall into the second cask, and from the second tray into the lower cask. These three casks will form a small set of vinegar generators.

Procure enough vinegar to damp the straw or twigs in the three casks. Pour it into the cavity above the false head of the top cask, and allow it to trickle through. When the straw is thus damped with vinegar, pour a small quantity of cider to follow it, and keep up the supply sufficiently to allow the liquid to keep on trickling over the straw and from one cask into the other.

For a few days the liquid which goes through will have to be poured back again, until you find it comes from the lowest cask as good vinegar. When this occurs, the passage of the cider through the three casks should be sufficient to fully oxidise it, or, in other words, to change it into vinegar, and the process will be continuous.

To perfect the plant there should be an automatic arrangement above the top cask to supply a small quantity, say a quart, of cider at stated intervals. How much must be determined by the working of the apparatus. If too much is run through, the conversion to vinegar is not complete.

After the vinegar comes from the generator, it must be placed in casks and placed in an open shed or in the open air for some weeks at least to mature.

Remember that the apples for vinegar should be ripe.

Tropical Industries.

THE KOLA NUT *(STERCULIA ACUMINATA).*

(Concluded.)

By H. NEWPORT, Manager, Kamerunga State Nursery.

Value and Uses.—Analytically the kola is found to contain alkaloids analogous to theine, coffeine, and theobromine, and a considerable amount of tannin. In taste it is first sweetish, then astringent, and finally bitter and unpleasant. Medicinally it is largely used by the natives of the countries where it is to be found, and it is said its value as a drug is becoming more and more recognised and used by the medical fraternity. The kola has stimulating and sustaining properties, and, like the *Erythroxylon coca*, possesses physiological properties enabling persons to undergo prolonged exertion without fatigue. It is used as a stimulant in wasting diseases and in the treatment of diarrhœa. It stimulates the nervous and muscular system, appeases hunger and thirst, and supports strength in the absence of food, leaving the digestive organs unimpaired. It is accredited with powers of clarifying beer or spirits, and rendering wholesome impure water, rendering tainted meat edible, and with having a favourable influence on the liver, and having aphrodisiac properties. Also, it is stated that one nut reduced to a paste and taken by a drunken man will sober him in half an hour, and that a heavy drinker cannot take stimulants for some time without nausea after having taken kola.

Commercially it is said to be steadily increasing in use, and consequently in demand, and it may yet enter largely into competition with tea and coffee. It makes a stimulating beverage with milk and honey, may be made into paste not distinguishable from cocoa, and mixed with it improves its qualities. Chocolate made from kola paste is said to be ten times more nutritious than ordinary cocoa, and that a working man can, with one cupful at breakfast, work on all day without fatigue. It is made up as kola paste, kolatina (like cocoa, but better), kola wine, kola tonics, &c.

The kola nut is also imbued with peculiar and fanciful powers or properties, and among certain natives of Africa is held as sacred. Oaths of special import are administered on the kola nuts, the hand being stretched out over them, and the nuts subsequently eaten by the one taking the vow or by both parties to the contract. White nuts are indicative of friendship and peace, and red of defiance. The presentation of white nuts to the mother of a native lady constitutes a proposal of marriage, which, if returned to the sender, knows his suit is accepted; but if a red nut is returned instead, he has been rejected, and the absence of the nuts at the marriage ceremony renders it invalid.

Cultivation.—The kola-tree may be treated in a similar manner to, and is even easier cultivated than cocoa, requiring but little attention from the time of planting out till harvesting, and practically none at other times. It is hardy and easily grown, is drought and water resisting, and will grow on dry or moist lands, but does best in low, damp, and steamy situations. In Ceylon it thrives from sea-level up to 3,000 feet, and in Fiji up to 1,000 feet. In this State, therefore, it would grow well almost anywhere north of about Mackay, except especially exposed situations where cold may be experienced, and would do especially well in the scrub lands about the Johnstone, and, indeed, all of the Northern rivers.

At the Kamerunga State Nursery.

The kola-trees at the State Nursery have taken an unconscionable time to come into bearing, which can only be attributed to the fact of the plants, which were imported in a wardian case, having been somewhat stunted, and subsequently to the dry situation in which they were planted. The drought-

resisting properties of the trees from the point of view of foliage, were fully borne out here; they do not show any signs of drooping even in the driest of seasons, keeping a somewhat dense foliage of glossy dark-green, but they do not bear satisfactorily under such conditions. The trees at the Nursery showed their first signs of bearing in 1900, when ten years old, which was several years later than was hoped and expected, and just then, unfortunately, the big drought set in, which no doubt prevented their again bearing until 1904, when at an age of fourteen years they bore their first fair crop. The plants raised from seed of these imported trees, if planted in situations above suggested in the more moist climates of the State, would, it is believed, come into bearing very much more rapidly.

The history of the plants imported to Queensland is as follows:—Some 100 plants were received in July, 1890, and put out in the field at once, where, however, it was found the majority were dying. They were then transplanted into the bush-houses, and again out in the field in February, 1901, and even then a number died back when some 18 inches high. By 1892 a few had attained a height of 3 feet, and apparently another consignment was obtained, but records are vague on this point. By 1893 some had attained a height of over 4 feet, but only eighteen had survived. By the next year these had grown another 2 feet; between 1894 and 1895 they grew 3 feet more, and propagation by cuttings, which had been tried since 1892, is reported as having been successful with great care under bell-glasses. The trees through this period proved anything but hardy, however. In 1896 a height of 12 feet is recorded as having been attained by them, and also disappointment at their showing no signs of bearing.

Reference is again made this year to a later importation with larger leaves, but few of which survived. The next year a memorandum is found to the effect that the specimens at the Mackay Nursery were killed out, apparently by frost, during the winter. From then till 1899 nothing special is recorded about them, but in 1900 one is reported to have blossomed and set some nuts, which it subsequently failed to mature, and reproduction by means of layering is recorded as successful. The next season some experiments in pruning some of the trees was conducted, with a view of forcing the blossom and crop, but were unsuccessful, and during the drought years following everything was at a standstill. In 1904 four trees bore some 84 pods, from which about 300 seed was obtained. This was after the heavy wet season, when a rainfall of 114.74 inches (for season ending 31st December, 1903) was recorded at the Nursery, which would tend to show that it is a more moist situation than that in which the parent trees now are that is required. Besides plants raised by means of layering, some 20 plants have been obtained from the seed, and these have grown both quickly and well, showing a sturdiness and hardiness that evidently was not possessed by their parents, supporting the idea that the progeny will both grow quicker and attain maturity sooner than the parents. Some of these plants have been planted out in situations that experience has shown to be required by the trees, and others are available for distribution to such as having suitable localities may care to plant a few of this valuable nut for use or experiment.

At present fifteen parent trees exist on the Nursery, one or two having had to be removed owing to too close planting. Of these the average height is 15 feet and girth 24 inches at 1 foot from the ground, with an average spread of 10 to 12 feet. The largest tree is 17 feet high, with a girth of 26 inches, and the smallest 12 feet with a girth of 18 inches. One clump of eight kola-trees planted 10 feet by 10 feet in Field 1, Section 1, are obviously too close together.

At present all the trees are showing blossom again except one. This is peculiar in growth, and appears to be a different variety; the leaves, however, are smaller rather than larger than the others, as is the whole tree. This may, therefore, be of the more recent lot vaguely referred to in the records, or may be a remnant of the first consignment; while the trees now in bearing are of a more recent importation, and therefore younger than stated, but this is scarcely probable.

THE JAVA PROCESS OF SUGAR-MAKING.

The practical experiences gained during the last few years in the most modern sugar-houses working with up-to-date machinery have led to the fact generally acknowledged by all experts that the making of low products (*i.e.*, second and third sugars from the runnings or molasses-sugar as it is termed in some countries) is not only usually a financial drawback, but also leads to a considerable loss in sugar. The object of a modern progressive mode of manufacture is therefore to construct sugar-houses where:

First sugar and completely exhausted final refuse molasses are made in one operation only.

The apparatus and process introduced by Dr. Block, Huch, Manoury, and others, all endeavour to produce this result (more or less successfully). The cane-sugar industry is, moreover, greatly interested in the attainment of this end. Here, to a greater degree than is the case with beet, the contents of glycose and acids are, as a rule, extremely high, and cause, without exception, serious losses in crystallisable sugar by reboiling and manufacturing low products; scientific researches having clearly proved that the most indifferent sugar-boiler cannot close his eyes to the advantages of making first sugar only if a high-class refined raw sugar is demanded.

For some time the working with masse-cuites has been brought to great perfection in Java, and all modern sugar-houses there are now making "first sugar and final molasses in one operation."

This success is chiefly due to the results attained by the eminent sugar expert, Dr. H. Winter, and his assistants and collaborators, as is well known from the "Archief voor die Java Suikerindustrie." Dr. Winter has been working out his process for ten years, continuously making improvements and simplifying the same until it has reached the perfection and high standard of the present day, yielding completely exhausted molasses with a purity as low as 28 to 32 per cent.

Our firm have great pleasure in acquainting our friends and the sugar industry generally, after Dr. Winter, this well-known authority on sugar-cane matters, left Java, we succeeded in securing the services of the learned doctor as consulting expert for exploiting the newest improvements in his process "First Sugar and Refuse Molasses," *i.e.*, "The Java Process." Dr. H. Winter has placed his long years of experience in this most successful process entirely at our disposal, and now superintends the construction of all our machinery, gives working instructions as well as the various important details necessary for "The Java Process."

Description of Machinery Required.

We can, therefore, guarantee to any sugar factory the same splendid results generally obtained in Java if the machinery we recommend is erected with proper superintendence and our directions strictly followed. In order to get the same excellent results as in Java, the vital point on which everything depends is, of course, successive co-operation of all stages of the process in the sugar-house, from the filtered juice-tanks down to the molasses-separating reservoirs. Generally speaking, the machinery required is not novel, but the accessories and devices in connection with this machinery are of great importance, and we cannot, therefore, undertake any guarantee unless our working instructions are strictly followed. In this connection it may be stated:—

1. The syrup or concentrated juice should be of the purest quality, no suspended matter which may surround the growing crystals (separating saccharose-crystal and mother liquor) may be present in the boiling liquor. A rapid and free crystallisation is the essential feature on which everything depends, and especially the exhaustion of the molasses. A series of "Standard Sand Filters" is, therefore, necessary to make the liquor as bright and clear as practicable. This can be effected without inversion by means of sand only.

2. The boiling liquor circulates in a vacuum pan of special construction fitted with Dr. Winter's patent injection system for syrup, steam, and air. The heating surface and the capacity of the pan must be properly proportioned, and the syrup introduced must be especially prepared.

3. The cooling down of the masse-cuite and the complete exhaustion take place in malaxeurs of special construction. The complete exhaustion of the mother-lye (the molasses) occupies about thirty-five hours, including the time used for boiling in the pan.

4. The centrifugals are so designed that there is no difficulty in separating crystals and molasses. Masse-cuites yielding syrup of less than 30 per cent. purity can be readily treated, whilst for high-class sugars provision is made to avoid an eventual washing of the sugar having any influence on the resulting low purity of the molasses.

5. A special system for the classification of the runnings is also required, *i.e.*, a system of tanks, the contents of which are under continuous control of the chemist, who carefully supervises the results of all previous operations.

ADVANTAGES OF "THE JAVA PROCESS."

The important advantages obtained by the process "First Sugar and Final Molasses" are obvious to any sugar-refiner, and are as follows:—

1. A considerable saving in wages.
2. Clean and convenient operation in the whole sugar department.
3. Dispensing with all storage tanks for second and third masse-cuite.
4. Considerable simplification of the whole plant.
5. No chemical losses by inversion.
6. No mechanical losses, no waste in tanks, gutters, and pipes.

The chief advantage, however, of "The Java Process" from a financial point of view is the higher prices realised and obtained for the sugar sold. By comparing the work done with and without the Java Process in two sugar-houses, the results obtained will speak for themselves. While personally introducing his process in the sugar-works, Bogokidoel (Kediri) and in Poh-Djedjer (Soerabia), and superintending the work done there, the following clearances were made by Dr. Winter. (For all details *see* Archief voor die Java Suikerindustrie, Volume V., page 23.)

Usine Bogokidoel: In the crop of 1896, with the old process, per 100 tons obtainable sugar the yield of commercial sugar was valued at £756.

In the crop of 1897, with "The Java Process," the yield amounted to £832.

This means on the total crop of 4,400 tons obtainable sugar a clearance of £3,300, or 16,558 dollars.

Usine Poh-Djedjer: Made at the same time on a crop of 4,700 tons sugar a clearance of £3,400.

This surplus was obtained although both the above-mentioned factories were working previous to 1897 with the best-known systems, the most intelligent superintendence, and full chemical control.

CALCULATION.

In order to enable the sugar manufacturer to calculate for his particular requirement how much profit may be gained in a sugar factory by adopting the improved methods of working down the masse-cuite in one operation, the following schedule has been drawn up. The local figures must, of course, be substituted to give the corresponding favourable financial results for the respective locality.

Comparison of Plants.

For a 70,000 metric tons sugar-house (700 tons per day).

A. Old Process:

Close mixers and tank-system combined—

GROUND FLOOR PLAN

Old System Low Product Sugar-house,
working with storage tanks,
700 tons Raw Material per day.
Scale equals 1 : 400.

The complete estimate for a comparatively new "Low Product Sugar-house" is given as follows:—

1 vacuum pan, 1 condenser, 1 vacuum pump, 2 Malaxeurs, 4 centrifugals, 1 vacuum pan, 1 condenser, 1 vacuum pump, 1 masse-cuite pump, 3 centrifugals, 1 pug-mill, 6 closed Malaxeurs, 18 storage tanks of 1,000 tons capacity, piping, gutters, sluices, shafting, &c.

To this should be added the staging and the complete building covering, more or less, 500 square meters, equal 5,400 square feet.

B. Java Process System:

Complete arrangement of modern sugar-house for low products—

New
Java Process Plan
as above, 700 tons.
Scale equals 1 : 400.

This embodies: 2 patent pans, 1 condenser, 2 vacuum pumps, 4 standard filter and clarifying tanks, 5 Malaxeurs, 12 centrifugals, shafting, &c., and molasses separating tanks.

To this has to be added the staging and the complete building, but this to cover only one-fifth of the old plant—*i.e.*, 112 square meters, equal 1,200 square feet.

Per 1,000 tons of first masse-cuite at a polarisation of, say, 82 per cent.

I. Old Process.

Worked according to the most modern methods with storage tanks. (*See* Geo. Stade, "On the Working of a Cane-sugar Factory and Refinery," the Sugar-cane, Vol. XXII., page 131), will yield:—

First sugar: 60 per cent. from 1,000 tons masse-cuite I = 600 tons at £10 or 48.7 dollars = £6,000 or 29,220 dollars.

Second sugar: 33 per cent. from 360 tons masse-cuite II = 118.8 tons at £8 or 39 dollars = £950 or 4,633 dollars.

Third sugar: 22 per cent. from 217 tons masse-cuite III = 47.7 tons at £7 or 34 dollars = £334 or 1,622 dollars.

Total: 766.5 tons = £7,284 or 35,475 dollars.

II. "The Java Process."

Making first sugar of 96.5 per cent. polarisation only:—

First sugar, minimum 80 per cent., from 1,000 tons masse-cuite at £10 or 48.7 dollars = £8,000 or 38,960 dollars.

Net profit per 1,000 tons of masse-cuite = £716 or 3,487 dollars in favour of "The Java Process."

For an average size factory, grinding, say, 50,000 tons canes and yielding, say, 15 per cent. first masse-cuite, or, say, 7,500 tons masse-cuite per crop, this means:—

1. A profit in sugar alone of about £5,370 or 26,152 dollars.
2. To this should be added: (*a*) Saving in labour; (*b*) saving in fuel; (*c*) saving in interest.—*Hawaiian Planters' Monthly.*

NOTES ON THE SISAL HEMP PLANT.

The sisal plant requires for its development a soil composed chiefly of limestone and a warm and comparatively dry climate. Clear, dry weather, with bright sunshine, is required to dry and bleach the fibre, while in rich, moist soil, or in a moist climate, the leaves develop too large an amount of pulp in proportion to the fibre.

The plant is propagated by suckers springing from the roots of old plants, or from "bulbils." Bulbils, called "mast plants," are produced in great numbers on the flower stalks in place of seed pods, like young onions. The plants are set out during the rainy season (in dry countries), in rows from 4 to 8 feet apart (in this country 8 feet is the better distance), in holes dug in partly disintegrated coral or lime rock, with crowbars, pickaxes, and often with the aid of dynamite. The ground where sisal is grown is usually too rocky to permit any stirring of the soil. The only care that need be given is to cut down the brush or grass or weeds once or twice a year.

The first crop of outer leaves of the plants is cut at the end of three years when grown from suckers, or four years when grown from bulbils. From 10 to 20 leaves are produced each year from a plant, for a period of from twelve to twenty-five years in Yucatan, ten to fifteen years in Cuba, and six to twelve years in the Bahamas. There are plants in Queensland which have not yet flowered, although over fourteen years old. An unusually cold winter at any period tends to check growth and cause the plants to send up flower stalks, after which they die.

Sisal fibre is cleaned from the leaves by machines, which scrape out the pulp, and, at the same time, wash the leaves in running water. It is then hung in the sun to dry and bleach for from one to three days, after which it is baled for market. The average annual yield is about 600 lb. of clean, dry fibre per acre, but a common return is from 15 cwt. to 1 ton per acre. During the past ten years the price has varied from 1½d. to 5d. per lb., or from £15 to £46 13s. 4d. per ton; the price has regularly increased during that period, notwithstanding increased production. In 1903, the United States of America imported 600,000 bales, averaging 360 lb. each, equal to over 96,428 tons, the average production of 321,426 acres. At the present price (1905) this represents a cash value of £3,474,980, of which sum over one-half is the growers' profit.

Sisal fibre of good quality is of a slightly yellowish-white colour, 2½ to 4 feet in length, somewhat harsher and less flexible than Manila fibre, but, next to that, the strongest and most extensively used hard fibre. It is used in the manufacture of binder-twine and general cordage, aside from marine cordage and derrick ropes. It cannot withstand the destructive action of salt water. It is used extensively in mixtures with Manila fibre.

The *Agave rigida, var. sisalana,* will not stand many degrees of frost, but slight frosts, such as are experienced in the coast lands of Southern Queensland, do not injuriously affect the plant. Another variety, from which the valuable Ixtle fibre is produced—viz., the *Agave Lechuguilla* of Western Tamaulipas—is hardy enough to withstand heavy frosts, and thrives well on the most worthless lands in the driest and most arid regions. The Ixtle is really not an agave. It belongs to the Bromeliaceæ, to which the pineapple also belongs.

SUGAR, BRANDY, BEER, AND FIBRE FROM THE SAME PLANT.

Amongst the fibre plants of Mexico is one called the "Maguey" or "Pita." It is properly not a true agave, although it is so closely allied to this family and is so similar in appearance, producing also a large quantity of excellent commercial fibre. The plant is grown in Yucatan, not only for the sake of the valuable fibre, but also for the production of a fiery brandy called mezcal, which is distilled from the roasted flower pole, which is cut from the centre of the plant just before it shoots up, or when it has the appearance of a

huge head of asparagus. This brandy, prepared in primitive fashion, is sold in enormous quantities in Mexico at about 2s. per bottle. But the number of pita plants used for brandy distillation falls far short of what are devoted to the manufacture of the national drink pulque, a kind of beer. As soon as the flower bud appears it is cut out so as to form a basin in the head of the plant, into which the sap runs freely. This sap is baled out every day and poured into pigskins, which, when full, are exposed to the sun for fifty hours, the gases formed during fermentation escaping through the rough stitching of the opening in the skin. This beer is very intoxicating, but the first taste of it is most unpleasant, and only by use is a taste for it acquired. The importance of the trade in this pulque beer may be estimated by the fact that special trains run daily to Mexico and other cities laden with pulque, and hence are called "pulque trains." Thousands of skins of beer are also sent by other means all over the country. When the mezcal and pulque have been extracted from the plant, the latter is cut down and the fibre is extracted from the leaves.

It has always been known from analysis that the flower heads of the aloes contain 9.2 per cent. of cane-sugar and 24.8 per cent. of grape or invert sugar, so it does not come as a surprise to us that a novel project has been set on foot in Mexico to manufacture sugar from the juice of the maguey plant. The *Louisiana Planter* says:—An American chemist of the City of Mexico has advanced the claim that a fine grade of sugar can be made from the maguey juice, and a company is proposed to test the matter. Many millions of maguey plants are cultivated in various sections of Mexico to supply the demand for native beverages, and up to this time no one believed that the juice held possibilities of sugar-production. The experiments will be watched with a good deal of interest.

PROFITS OF A COTTON GINNERY.

From the Barbados *Agricultural News* we learn that the committee appointed at a meeting of the Agricultural Society on 6th February, 1903, to co-operate with the Imperial Department of Agriculture for the West Indies in its endeavour to establish a cotton industry in Barbados, has submitted an interim report covering the period from 25th June, 1904, when the Central Cotton Factory was reopened by His Excellency the Governor, Sir Frederic M. Hodgson, K.C.M.G., to 31st November, 1904. The report says:—

The building now used as the Cotton Central Factory was originally built in Christ Church at a cost of £283 10s. 6½d., for a smallpox hospital, but was never used. This building was loaned by the Governor-in-Executive Committee to the Imperial Department of Agriculture. The Legislature then voted £370 for moving the building to the Pier Head, building the foundation, and erecting the machinery, &c. Of this sum £363 2s. 10d. was expended. The balance, £6 17s. 2d., lapsed into the Treasury at the end of the financial year, 1903-4. In addition, the British Cotton-growing Association made a free grant to the Cotton Committee of £100. They also loaned the Cotton Committee six gins and a baling-press, for which the association may accept less than they originally cost. The British Cotton-growing Association have also, at the request of Sir Daniel Morris, recently loaned the Cotton Committee a disintegrator outfit, of the estimated value of £100, for crushing the cotton seed.

The probable total cost of the Cotton Central Factory, it is estimated, will be £966. From this, however, must be deducted the £100 granted from the British Cotton-growing Association, leaving the cost of the factory at £866, which in whole or part will eventually have to be repaid.

From the time the factory was started in January, 1904, to the end of October, 360,923 lb. of seed cotton have been ginned, yielding 104,923 lb. of lint and 251,383 lb. of seed. The lint obtained was 29.06 per cent. of the weight of seed cotton ginned. The loss incurred during the ginning, due to the seed and lint drying, and to the dust, &c., in the cotton and lint, amounted to 4,672 lb., or 1.30 per cent. of the weight of seed cotton. The lint was made

into 378 bales, weighing on the average 277.6 lb. each, of which 362 were shipped by the factory and 16 delivered to the owners or their agents. The receipts from ginning the 104,923 lb. of lint at 3 c. per lb. are £655 15s. 4½d., the value of crushing the 94,361 lb. of seed at 6 c. per 100 lb. is £11 15s. 11d., making together the total receipts of the factory £667 11s. 3½d.

The expenses to the end of November amounted to £342 1s. 3d., leaving a balance at that date of £325 10s. 0½d. Of this it is proposed, in accordance with the decision of the Cotton Committee, to divide *pro rata* among the growers what was left after deducting all expenses for ginning, &c., £218 11s. 9½d. or 1 c. per lb. of lint. This will leave on hand £106 18s. 3d.—sufficient to purchase new rollers, new shafts, walrus hide, to pay for the erection of the new baling-press, to pay small sundry accounts which have not yet been received, and generally to put the Cotton Central Factory in as good a condition as it was at the beginning of the last season, leaving a small balance on hand, estimated to be about £30.

Thus, in the first season, practically over 50 per cent. profit was made by the company. The quantity of cotton ginned, allowing 1,000 lb. of seed cotton per acre, was produced on about 361 acres. Mr. Sanderson and Dr. Thomatis, in Queensland, assert that they can produce 2,000 lb. of seed cotton per acre in the Central and Northern districts. If this be so, then the area required to produce 360,978 lb. of seed cotton would only amount to 180 acres. Yet there are not 100 acres of cotton grown to-day in Queensland, after all the experience of past years, after the agitation which has been going on during the past three years to establish the industry, after the action of the Agricultural Department in importing several tons of seed of the best varieties, after the tour of Mr. Bottomley through the probable cotton districts. As to a ginnery, so far as we know, the only enterprise in this direction is being shown by Messrs. Kitchen and Son, who are importing ginning machinery, and, in addition to the lint, will crush the seed, extract the oil, and produce oil cake. Is there any such enterprise at all among other firms in Queensland outside the sugar industry, which itself stands in need of the bonus on white-grown sugar as far as North Queensland is concerned, and the wheat-growing and dairying industries? It is not a question of black or white labour. Cotton-growing has been successfully carried on by white labour, and so can it be to-day, if once the farmers will see that a small area on each farm will always add to their income without appreciably adding to their expenses. There is too general an inclination to look to the Government to do everything in connection with new industries, but people forget that if the Government were to spend £10,000 in advancing the cotton, sisal hemp, or any other new industry, that £10,000 must come out of the people's own pockets in the shape of taxation. The proper course would be for the people first to help themselves, and then, if necessary, ask for assistance to extend an industry already established.

PROFITS OF COTTON-GROWING IN BARBADOS.

The following from the *Agricultural News* of Barbados is an abstract of a statement of expenditure and receipts in connection with the cultivation of cotton upon 22 acres on an estate in Barbados:—

The land was planted in cotton and corn. The expenditure on planting and cultivating the two crops, including digging cane holes, weeding, supplying, &c., was 65.74 dollars (£13 3s. 1d.), the cost of reaping the corn (254 bushels), picking, ginning, and baling the cotton was 456.20 dollars (£91 5s.), making a total of 521.94 dollars (£104 8s. 1d.).

The receipts were: Sale of 6,925 lb. of lint, netting 1,957.21 dollars (£391 9s. 2½d.), or a little over 1s. 1½d. per lb.; estimated sale of 162 lb., at 1s. 4d. per lb., 45.36 dollars (£9 1s. 6d.); value of seed crushed, 266.07 dollars (£53 4s. 2d.); value of corn, 203.20 dollars (£40 13s. 4d.), bringing the total receipts to 2,471 dollars (£494 4s. 2d.).

The profits from the 22 acres were, therefore, 1,949.90 dollars (£390), or £17 14s. 6½d.

The above results are worth analysing, as they furnish a guide to what may be done in Queensland. We may say that we do not agree with the plan of growing corn between the cotton rows, however rich the soil may be; however, that is a matter of opinion.

The planting and cultivation of the cotton and corn amount to about 12s. per acre. Picking both crops and ginning and baling the cotton amount to a little over 1d. per lb. of cotton. The quantity of seed cotton yielded per acre is about 21,000 lb., or less than 1,000 lb. per acre. The maize yielded only 11½ bushels per acre. We do not know the value of maize in Barbados, but, supposing it to be worth, as here shown, 3s. 2d. per bushel, it would not only pay for the cost of planting and cultivating both crops, but contribute £27 10s. 3d. to the cost of picking both crops, ginning, and baling, leaving only £63 14s. 9d., or about £2 11s. 9d. per acre to be paid out of the proceeds of the cotton.

How does this compare with experience in Queensland? Taking, as in the above case, 1,000 lb. of Sea Island cotton as the yield of seed cotton per acre, 22 acres would yield 22,000 lb., or, as above, say 21,000 lb. The cost of ploughing, planting, and cultivating come to 13s. per acre; picking, ginning, and baling to about 1d. per lb., or at most 1¼d. per lb. Thus 22 acres can be planted and cultivated for £14 6s., as against £13 3s. 1d. in Barbados.

Picking, ginning, and baling the cotton at, say, 1¼d. per lb. will in this State amount on 22 acres to £114 0s. 3d., as against £91 5s. These expenses total for Queensland £115 6s. 2d., for Barbados £104 8s. 1d. We, of course, reckon on white labour here as against black labour in Barbados, yet the difference in cost amounts to only £10 18s. 2d. 6,925 lb. of lint would yield, at 1s. 1½d. per lb., £391 9s. 2½d.; the value of the cotton seed crushed would be the same as or perhaps more than in Barbados, but say £53 4s. 2d.—a total return of £444 13s. 4½d. We do not include a crop of maize. It is a poor crop of maize which will not yield 20 bushels of grain, even when grown between cotton rows. To equalise the comparison, we will include 22 acres of maize at 20 bushels per acre. This gives us a further return of 440 bushels, or, at an average of 2s. per bushel, £44; thus bringing the gross return of the Queensland crops to £488 13s. 4½d. Deducting expenses—£115 6s. 2d.—the net profit following the Barbados experience should be in Queensland £373 7s. 2d., or £16 19s. 4¾d. per acre.

In the case of Uplands cotton this profit would be reduced to what we have generally placed it at—viz., about from £5 to £6 per acre, reckoning cotton lint at 6d. per lb. and the woolly seed at considerably less value than the naked black Sea Island seed.

Unfortunately Sea Island cotton will not give such returns inland. This variety requires the damp salt air, which is only to be found on or very near the sea coast.

GROWING CIGAR-LEAF IN NORTH QUEENSLAND.

By R. S. NEVILL.

DURING my recent visit to the North Coast country I examined carefully much of the soil, and am of the opinion that a great deal of the land is suitable for tobacco-growing, and more especially the country from St. Lawrence to Mackay, about Bowen and the Lower Proserpine, especially on Kelsey Creek, and from Cardwell north as far as Cairns.

As the climate has quite as much to do with the production of good tobacco as the soil, we *cannot fully determine* whether or not they will produce a superior quality until the experiment has been tried; but I feel sure that those who attempt it, and are careful and painstaking, will get satisfactory

results. The experiment is certainly worth trying, and those who are first in the field to make a success of it will be richly rewarded for their labour.

Good cigar-tobaccos have always been scarce, and fetch high prices in the world's great markets—prices that will justify hiring labour for the work.

The Dutch company that first began tobacco-growing in Sumatra, in the early sixties, have averaged 75 per cent. dividends annually from the beginning, besides adding to the value of their holdings over 500 per cent. without additional calls upon the stockholders. It is true this has been done with cheap labour, but these immense profits leave a margin of good profits for ordinary labour. There has been no market in Queensland for cigar-tobacco for a number of years, but Sydney and Melbourne are large buyers of cigar-leaf, and if a superior leaf is grown here a market can be found for it; but intending growers should remember that buyers want good tobacco, the world is full of worthless stuff, and to make it good requires care and faithful attention to every detail.

For the information of those who may desire to try the experiment, a few suggestions for their guidance will be of assistance.

SOILS.

The soil should be a warm sandy alluvial one, well drained and rich in humus or vegetable matter—a soil that is friable and capable of the finest tilth, and such an one as will retain its moisture. There should be no clay, or very little, as clay soils tend to make the leaves very thick and gummy, which is objectionable in cigar-tobacco. The land to be planted should be at least 5 miles from the sea-coast, that it may not be affected by the sea air, which injures its burning quality. The ground should be well and deeply ploughed, cross ploughed, brought to as great fineness as it is possible to do, and should be kept clean. Cloddy ground will grow tobacco, but it will not have so good a flavour or texture as when the soil is thoroughly pulverised.

WHEN TO PLANT.

It is best to plant at a time when the harvesting will come on at the end of the rainy season, as near as may be; and, in order to determine that, it will take from six to eight weeks from time of sowing until the plants are large enough to transplant. This is the usual time, though sometimes under favourable conditions one month is sufficient. After transplanting, when the plants have taken root, they will take from sixty to seventy-five days to mature. The reason for harvesting at the time mentioned is, that it is not desirable to have the hot drying winds when the tobacco is curing, as then it will be subject to changing conditions that make it green and splotchy, and the leaf is liable to be harsh and dry, whereas it should be soft and flexible.

Tobacco should never be hung in open sheds, but in closed-in, well-ventilated ones; neither should it be exposed to hard drying winds either in sheds or fields; hence fields should be as much sheltered as possible.

MAKING SEED BEDS.

Seed beds should be sown, and the plants transplanted to the field, just as is done with cabbage. Virgin soil is the best for seed beds. After clearing the soil of any timber growth and before stirring the soil, wood, bark, and leaves should be placed on the land and set fire to. The ground should be burned sufficiently to destroy all weed seeds, grass roots, &c. The reasons for this are several. It destroys weeds and grass, and no weeding of the beds will be necessary, and this saves much time and labour; the ashes serve as a good fertiliser, and the small bits of charcoal greatly conserve the warmth of the bed. After the ground has cooled, rake off any debris that may be left unburnt, but leave the ashes on. Dig the bed well to the depth of 6 or 7 inches, taking care to reverse the soil; work and rake it until you have made as fine as possible.

Sowing Seed Beds.

The quantity of seed to be sown is about a teaspoonful to a bed 5 by 20 feet or 100 square feet. The day before sowing put the seeds into a glass of water, and let them stand for two or three hours. By that time, all the seeds of strong vitality will have settled to the bottom of the glass; those left floating on top are either sterile or of such low vitality as to produce only weakling plants. Pour off the water, and take only the seeds left in the bottom of the glass. Dry them in the sun or near the fire; then mix them with ashes or lime thoroughly, and sow evenly over the bed. In drying seeds after taking from the water, only a few minutes are necessary, to get the dampness off them that they may not stick together when mixing with the ashes or lime. After sowing the seed, do not rake or tramp it in, but take a sprinkler and sprinkle water *well*, *carefully*, and *evenly* over the bed, not allowing the water to run in little streams on the surface, as this disturbs the position of the seed and makes the plants thick and thin in the bed. As the water soaks in, go over the bed again and again, until it is well watered. This will give a sufficient covering of earth to the seed.

Treatment of Seed Beds.

After sowing, the beds should be covered. Butter cloth or calico is best; but, in the absence of these, grass can be used. This covering is necessary, as the hot sun will kill the plants as they sprout, or "in the crook," as the Yankees say.

As the plants begin to grow, they should be gradually hardened by removing the covering each day for awhile, making the time longer each day until they are left entirely uncovered for a week before transplanting. If the weather is dry, the beds should be watered at least every other day, late in the afternoon, until the plants come up, which may be a week or it may be two weeks, owing to the season.

After the plants are well up, water as they need it, but not too much, or they will grow up thin and sappy, and will not stand transplanting so well. Before sowing the seed, it is a good plan to sow about one-eighth of an inch of sand over the bed. This prevents the ground cementing so badly when the plants are being watered. When they have developed four to six leaves, care should be taken not to water too much, or "blue mould" may develop on the plants. They should only have enough water to keep them healthy. A slow-growing plant in the bed, if healthy, is usually hardy. Thin out the plants if they are too thick in the bed.

Transplanting.

This should be done late in the afternoon. The rows should be 3 feet 6 inches apart, and the plants placed 18 to 22 inches apart in the rows. Select strong healthy plants with good lengthy stocks, and set them well down in the earth, pressing the dirt well to the roots. By having long stocks and setting the plant deep, the roots rest in the moist earth and will thrive better. In drawing the plants from the seed beds, it is best to take a three-tined steel table fork and raise the plant with it. This leaves a good bunch of earth clinging to the roots, and enables the plant to take root better. Transplanting should be done after rain, or in cloudy weather, as much as possible; but if the weather be dry, water should be used to set the earth about the plant, and early next morning a light covering of grass should be put over each plant before the sun is up. If the weather continues dry for some days, it will be necessary to water the plants occasionally until they take root. This can be done by using a bucket of water and a cup. Pour about a pint over each plant. This should be done about sundown; it is not necessary to remove the grass covering when watering.

Cultivation.

Clean cultivation is necessary. After the plants have taken root, the field should be gone over with a hoe, the earth loosened about the plants, and the weeds chopped out. When the plants are 3 or 4 inches high, a Planet Junior

with the small points should be run between the rows. The Planet Junior should be well opened out, and run as close to the plant as possible without cutting it up, and it should be run to its full depth to form a loose root bed that the roots may run and not be dwarfed.

This ploughing should be done every ten days, but not run so close to the plant, until the plants are 12 or 15 inches high. Then a pony turning-plough with one horse should be used for hilling up. When this is being done, the plough should not run closer to the plant than a foot.

The tobacco should be kept free from grubs. The time to look for these is early in the morning. Later on come the topping and priming, which should be done promptly when the time arrives. Topping is pinching out the seed bud, and priming is breaking off three or four bottom leaves to let the air circulate under the plant. Topping and priming should be done at the same time; and after this is done, there should still remain on the plant eighteen or twenty leaves.

Do not let your plants flower, except such as you want for seed. After topping, suckers will shoot up from the base of the plant and where each leaf joins the stalk. These should be kept broken off, and not allowed to grow to any size. Suckers will have to be taken off two or three times before the crop ripens.

HARVESTING.

Tobacco should not be cut until fully ripe, and this will be known by the leaf drooping and being rough on its surface, brown spots appearing on the leaf, and when the latter is doubled up it will split along the fold. Cutting should not be done in the heat of the day if the weather is hot.

The stalk should be split to within 6 or 8 inches of the ground, and then cut off at the ground, gently laid down with the butt towards the sun. Let it lie until it is thoroughly wilted, which will take from thirty minutes to an hour, according to the weather. After it has wilted, hang it astride a stick. Other methods of harvesting are practised, such as spearing the stalk, also gathering the leaves and stringing them; but the above is the simplest to beginners. In hanging on the stick, each plant should occupy a space of at least 6 inches to prevent crowding—that is, fully 6 inches between the plants.

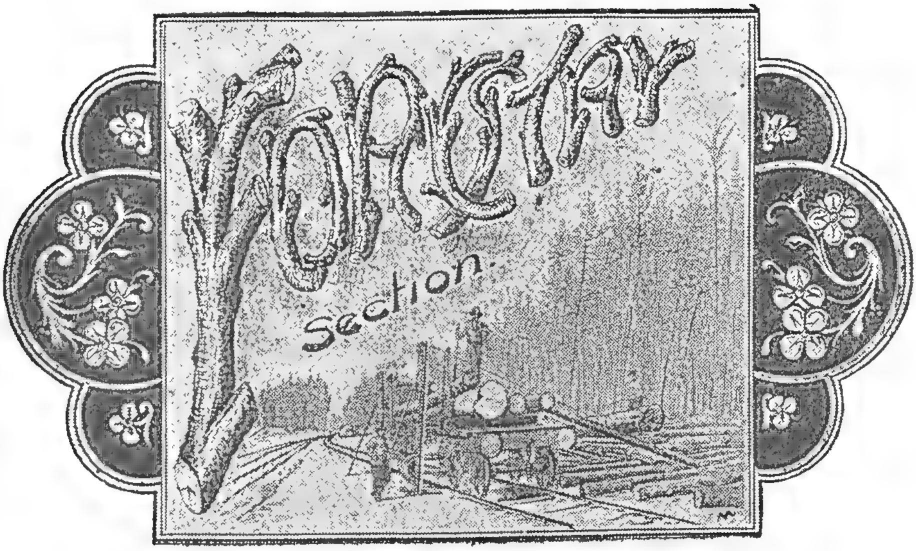
For convenience, a scaffold can be erected on the field, and the sticks of tobacco hung on it for two or three days until thoroughly wilted. Care should be taken that no rain falls on it. When taken to the shed, the sticks must not be hung too close together, but so placed that the tobacco on one stick barely touches the tobacco on another. It should be opened out well on the sticks. If this care is not taken, it may house burn and stem rot, either of which destroys its value.

After hanging in the shed, give plenty of ventilation for the first two or three weeks, but protection from hard drying wind must be afforded. After this time, so much ventilation is not needed, but it is not advisable to have the shed too close.

In curing tobacco, the conditions should be as uniform as possible, or any changes should be very gradual.

Fire should not be used in curing cigar tobacco, except when the weather continues wet and it is likely to be damaged, and then for only an hour or two at a time. Stoves may be used to dry out the room; but the pipes should run outside, and no smoke allowed to get on the tobacco.

The cigar-leaf industry is a valuable one, and, if once developed in this State, will be found to be exceedingly valuable to the small grower, especially to those farmers who are at some distance from shipping points, and have to haul their produce considerable distances. To such farmers I specially commend the crop; at the same time it is a profitable crop to all farmers when a high-grade leaf can be produced.



Conducted by PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

THE FOREST.

(A Preliminary Lecture delivered to the students of the Queensland Agricultural College.)

By PHILIP MAC MAHON.

(Continued.)

Man is a classifying animal. Whenever he has to deal with a large mass of facts, his first instinct appears to be to divide them into classes, in order that he may view them and deal with them to greater advantage than singly. And in the management of forests he has formed no exception to the general practice. The constitution, regeneration, and utilisation of forests in all countries where attention commensurate to its importance is given to the subject of forestry, proceed on definite and well-understood lines; and our chat to-day will be an endeavour to make ourselves acquainted with the systems upon which forests are managed on a large scale. I have thought it better to thus interest you in the subject at the outset, and later on we shall see what bearing the different habits, rates of growth, and the like of trees has upon the several systems referred to.

Now you can readily imagine three kinds of forests. Firstly, the ordinary forest which has been the growth of perhaps centuries, in which the trees have been produced from seed. This is known as "high forest"; secondly, a forest in which all the trees originally produced from seeds have been cut over, but a second growth of suckers is springing from the stumps of the old trees. This is called "Coppic forest"; and, thirdly, a forest which is made up of high forest and coppice forest in varying proportions. You will see that all forests, in whatever part of the world, may be described under one of these three headings.

Now each of these kinds of forests can be worked in several different ways, and each is capable of being converted into another kind of forest. Thus, if you cut over your high or seedling forest, and allow the shoots to grow from the stumps, you have at once Coppice forest, or you can cut only a portion of your mature seedling trees, and the coppice which grow from their stumps will render your forest a mixed high and coppice forest. Or, again, you may allow some of your coppice to attain large dimensions while you keep the rest cut, or you may gradually convert your coppice into high forest. The combinations are many, and these have given rise to a large number of what have been termed sylvicultural systems.

In dealing with these at first we will, if you please, only consider them in relation to the actual formation and regeneration of the forest itself, and without looking at the surrounding circumstances, such as communications, market, and the like, which have such an important bearing on the preparation of the actual working plan. We will imagine that our sole object is the creation of a wood or forest of the several kinds. There are certain circumstances which will have to be taken into account even from this point of view, and these may be briefly set down as follows:—

1. The existing character of the forest, and the manner in which it is intended to provide for its perpetuation.
2. The injuries likely to accrue to the forest itself from the mode of regeneration proposed.
3. The amount and kind of timber and other produce likely to be produced under the system adopted, and, of course, whether the adoption of some other system would not produce a larger yield, or a yield of better quality.
4. What effect will the system to be adopted, or which it is proposed to adopt, have upon such local circumstances as conservation of moisture for the benefit of young trees, protection from wind, the shade afforded to young plants, and is this likely to prove injurious or advantageous. These and other considerations affecting the growth of the forest go to make up the set of conditions which Schlich, one of the ablest and most authoritative writers on forestry in the world, calls "the factors of the locality." The title is so expressive that, if you please, we will use it when we wish to speak of the circumstances inherent to any locality which has a beneficial or contrary effect upon forest growth.

Just here I would like to direct your attention to a quality which you may have no doubt observed, not only in forest trees, but in all plants. That is the quality of requiring, or being able to endure, a greater or less amount of shade. To give you familiar examples, you are aware that if you impede the direct light to the weed called "nut grass" it will not thrive, and that, if you erect a bush-house over the most luxuriant patch of it, it will dwindle away and die. And, on the other hand, this is the very condition which ferns (or most of them) require. You will now recollect that in wandering through a deep wood you saw some young trees only on the skirts, where there was a tolerable amount of light, whilst others seemed to grow upwards under the dense canopy spread above them. Trees which bear shade well are called "tolerant," meaning, of course, tolerant of shade, and those which do not bear shade are called "intolerant." Some trees are tolerant in the early stages of their growth and intolerant afterwards, others are always tolerant, others again always intolerant, some possess the faculty of waiting even for years under the dense overhead canopy, as seedlings, and then, when the light comes, of shooting up at once. The habits of our timber trees in this and similar connections have not been subjected to the same close study as have the tree in Europe and America, and less thoroughly in India. I commend to my hearers the habit of noting the behaviour of different forest trees under shade conditions, and I may say that I shall be most happy to receive at any time any notes which you may make on the subject.

You will readily perceive the important influence which the tolerance or intolerance of trees may exercise on the choice of a sylvicultural system.

Schlich, in his classical "Handbook of Forestry," divides the sylvicultural systems in the following manner, and it is a good classification to follow. I may say that there is no end to the combinations of these systems:—

I. High or seedling forest—

A. 1. Clear cutting and subsequent regeneration.

2. Regeneration under a shelter wood by compartments.

3. Regeneration under a shelter wood by groups.

4. Regeneration under a shelter wood by single trees.

B. 5. Coppice forest.
C. 6. Combination seedling and coppice.

II. Auxiliary systems—
7. High forest, with standards.
8. Two-storied high forest.
9. High forest, with soil-protection wood.
10. Forestry, combined with the growth of field crops.
11. Forestry, combined with the breeding of cattle.

Let us glance at the peculiar features of these systems.

1. *Clear cutting and subsequent regeneration.*

When you clear off a forest as you would a field of corn, and start a new crop, or when you sow or plant a forest where one has not before existed, you have an example of the first and simplest system. Except in a very small way, this system is not suited for Australian conditions, and may be passed over with the observation that it is calculated to supply a fine even crop of valuable timber, and that with judicious thinning, as the trees acquire marketable dimensions, the forest may be made to adapt itself to natural regeneration, or be worked on a simple plan of thinning and clean cutting when the timber shall have come to final maturity.

2. *Regeneration under a shelter-wood by compartments.*

I have heard this system spoken of as the "Block system." It is really a group of systems, such as the Group system, the Zone system, the Strip system, and it means broadly that you divide up your forest into compartments, and then reduce the canopy over each compartment in succession by thinning out the marketable timber, and, where the conditions admit, the diseased and useless timber, working over the compartment until the leaf canopy is suited for the growth of a new crop under the best obtainable conditions as regards shade and room for growth, having regard to the habits of tolerance or intolerance of the species under treatment. The compartment is of such dimensions as you can work in a season. Your energies are concentrated on it for the time being, and when you have worked out all your marketable timber, you leave it to recuperate. The young seedlings then begin to forge ahead, fresh seed is shed, the trees which you have left standing to afford the necessary degree of shade begin to consolidate their tissues, they acquire renewed activity, and the foundation has been laid in that vicinity for the production of useful, marketable timber, and an unfailing supply of it. Meanwhile you have begun to operate on a fresh compartment in the near vicinity, and it requires no very great arithmetician to convince you that, if you divided your timber district into, say, thirty compartments, by the time you have worked out your last compartment the one you started on will be bearing timber thirty years old.

The compartments should follow as far as it is possible the natural boundaries of the district, as the edges of the plateau, the courses of rivers, roads, mountain ridges, and in new country it is needless to say that simplicity should be studied to the very utmost. A plan is, of course, a great advantage, and in all well-managed forest properties the compartments are carefully mapped out as in this sketch of a forest under the control of the French forest department, or this highly-finished plan of a large forest estate in Scotland, prepared by Lieutenant-Colonel F. Bailey, R.E. A working plan may, however, be complete without a map or plan, in the ordinary sense of the word, at all.

(To be concluded in our next.)

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1904.											1905.	
	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
North.													
Bowen	2·65	1·12	0·31	0·25	0·30	Nil	Nil	Nil	1·66	0·16	4·33	22·69	0·50
Cairns	10·55	15·73	13·33	3·21	Nil	0·35	0·62	0·12	0·37	0·12	7·88	25·74	8·59
Geraldton	14·01	31·09	38·73	11·81	0·39	1·78	3·99	0·76	2·49	1·18	7·35	28·37	5·71
Herberton	5·16	18·25	7·08	1·55	Nil	Nil	0·59	0·44	0·62	1·15	2·06	7·39	3·37
Hughenden	2·80	1·93	1·36	0·07	0·44	Nil	Nil	0·22	4·10	1·76	0·28	3·37	0·07
Kamerunga	9·39	22·35	15·48	3·50	Nil	0·42	1·05	0·27	1·00	0·43	11·62	29·08	7·56
Longreach	2·69	1·01	0·31	2·78	0·04	Nil	Nil	Nil	4·66	0·72	1·34	1·17	0·53
Lucinda	8·40	22·10	11·30	4·00	Nil	0·15	Nil	2·00	1·90	0·50	2·10	15·40	1·68
Mackay	3·17	5·69	5·24	3·61	0·93	0·12	0·04	8·14	8·07	Nil	1·52	29·89	4·73
Rockhampton	3·50	5·11	13·82	0·77	1·26	0·03	Nil	0·22	1·36	1·32	1·60	15·39	0·92
Townsville	5·19	4·01	1·03	0·24	0·04	Nil	Nil	0·04	3·67	1·17	5·70	13·71	1·97
South.													
Barcaldine	0·96	0·11	1·19	3·85	0·16	Nil	Nil	0·20	3·88	1·02	6·54	1·85	0·12
Beenleigh	1·25	8·06	14·99	6·17	0·15	1·54	0·25	2·11	1·89	4·43	4·55	5·44	3·04
Biggenden	0·71	3·16	2·92	2·29	0·71	0·29	0·20	Nil	4·06	1·08	5·89	13·05	1·94
Blackall	3·67	0·39	3·76	3·08	0·32	0·12	0·14	Nil	4·99	0·53	5·04	3·19	0·23
Brisbane	0·77	7·07	7·23	4·04	0·59	1·48	0·53	1·59	1·28	2·36	3·65	9·09	2·64
Bundaberg	0·85	4·26	5·64	1·32	0·86	0·51	0·62	0·48	3·32	0·16	5·16	16·67	2·17
Caboolture	1·32	8·48	9·90	4·66	0·17	2·12	0·30	1·53	2·42	3·07	7·36	8·10	3·43
Charleville	2·56	4·60	3·62	3·07	0·31	0·52	0·15	0·40	3·14	0·09	2·51	1·70	0·73
Dalby	3·20	4·74	0·40	4·69	0·34	2·63	0·24	3·01	1·07	2·59	2·15	3·40	0·74
Emerald	1·26	1·14	5·88	1·23	0·96	0·06	0·09	0·06	1·44	2·43	2·44	7·77	0·25
Esk	1·86	3·18	4·91	3·99	0·20	2·43	0·33	3·10	2·90	2·90	3·07	8·26	0·85
Gatton College ...	1·20	4·17	2·59	3·79	0·45	2·12	0·07	1·09	1·95	1·14	2·42	5·57	1·10
Gayndah	1·83	2·97	1·63	1·61	0·93	0·99	0·41	0·27	2·49	0·67	2·36	11·34	0·82
Gindie	1·40	1·83	4·81	1·65	0·43	Nil	0·21	0·02	3·09	1·55	2·02	7·07	0·06
Goondiwindi	2·65	7·32	0·37	3·40	0·49	2·62	0·67	1·64	1·09	1·61	1·62	3·37	0·87
Gympie	1·80	3·32	10·86	4·11	0·60	1·11	0·47	0·84	4·08	2·55	3·94	9·75	2·29
Ipswich	1·72	3·55	4·71	3·50	0·23	1·75	0·05	1·56	3·20	1·62	4·25	6·87	1·30
Laidley	1·35	5·36	2·83	3·12	0·32	1·68	Nil	1·87	1·87	3·99	5·26	9·93	2·33
Maryborough	0·56	3·94	10·07	4·42	1·37	0·39	0·16	0·62	3·52	2·62	2·33	20·69	2·67
Nambour	1·91	10·30	15·43	6·94	0·32	1·78	0·59	0·43	1·62	2·08	7·54	13·50	5·38
Nerang	0·85	11·18	13·83	7·52	0·19	1·12	1·22	2·21	3·52	2·39	3·85	4·95	4·99
Roma	0·59	2·32	5·06	3·73	0·20	0·84	0·70	1·22	1·43	0·03	1·76	2·65	1·74
Stanthorpe	1·33	6·57	0·71	4·11	0·66	2·64	0·34	1·85	3·98	1·92	5·00	3·04	0·37
Tambo	1·72	1·26	5·46	3 96	0·28	0·61	0·22	Nil	3·31	0·80	3·90	3·54	1·34
Taroom	2·79	1·58	2·21	3·49	0·54	0·59	0·82	0·05	2·42	1·73	2·92	3·25	1·63
Tewantin	2·59	19·55	30·39	9·20	0·21	1·11	2·20	0·50	1·09	1·93	7·61	11·79	2·91
Texas	3·67	5·72	0·03	2·99	0·70	2·12	0·48	0·81	1·63	0·76	2·97	3·77	0·09
Toowoomba	3·98	4·76	3·29	4·08	0·38	2·58	0·02	2·24	1·61	2·26	2·75	4·50	1·91
Warwick	2·91	5·74	0·66	2·85	0·53	1·98	0·19	2·76	2·89	1·92	3·65	1·52	1·28
Westbrook	2·82	3·49	9·00	3·18	0·22	2·24	0·14	2·29	4·85	3·37	3·65	2·46	0·57

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian: Victorian, 103s. to 104s.; New South Wales, 104s. to 106s.; Queensland, 100s. to 102s.; Danish, 110s. per cwt.

CHEESE.—Canadian, 53s. to 54s.; New Zealand, 52s. to 53s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £24 to £24 10s.; raw, £17 to £20 per ton; German beet, 88 per cent., 15s. $1\frac{1}{2}$d. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt. and $\frac{1}{8}$ per cent.).—6s. to 9s. per cwt.

RICE.—Rangoon, £8 10s. to £12; Japan, £12 to £16; Java, £18 to £20; Patna, £16 to £17 per ton.

Coffee (in bond, duty 1½d. per lb. and ⅕ per cent.).—Ceylon plantation, 110s. to 130s.; peaberry, 62s. to 120s.; Santos, 40s. to 58s.; Mocha, 56s. to 90s.; Jamaica, 105s. to 125s. per cwt.

Chicory Root, dried (duty paid).—26s. to 27s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 34s. to 35s. to 38s. per 496 lb.; English, 32s. to 35s. per 504 lb.; Australian, 33s. per 496 lb.; Queensland (ex "Banffshire") 32s. 7½d.

Flour.—31s. to 32s.; Australian, 26s. to 27s. to 33s. per 280 lb.

Malting Barley.—33s. to 37s. per 448 lb.

Oats.—17s. to 19s. per 336 lb.; New Zealand, 21s. to 23s. per 384 lb.

Split Peas.—37s. to 47s. per 504 lb.

Ginger.—Jamaica, 45s. to 55s.; Cochin, 50s. to 55s.; Japan, 16s. to 17s. per cwt.

Vanilla.—3s. to 7s. per lb.

Pepper.—Capsicums, 14s. to 60s.; chillies, 40s. to 45s. per cwt.; black, 5d. to 5½d.; white, 8¼d. to 11d. per lb.

Green Fruit.—Apples: Australian—Jonathans 17s., other 10s. to 15s.; American pippins, 28s. to 30s.; Baldwins, 12s. to 16s.; Canadian, 14s. to 20s. per case; bananas, 11s. per bunch; pineapples, 3s. 6d. to 8s. each; oranges, Valencia, per 420, common, 7s. 3d. to 8s.; medium, 9s. to 11s.; fine selected, 15s. to 18s.; finest selected, 24s. to 26s.; lemons, Messina, per 360, finest selected, 20s. to 23s.; ordinary to fine, 12s. to 15s.

Dates.—Tafilat, 80s. to 90s.; Egyptian, 30s. to 32s. per cwt.; Persian, 8s. 9d. to 11s. 6d. per case.

Cotton.—Uplands, 5¾d. to 6d.; Sea Island, 1s. 2d. to 1s. 8d. per lb.

Cotton Seed.—£6 to £7 per ton.

Cotton-seed Oil.—Crude, £13 5s.; refined, £14 10s. to £16 10s. per ton.

Cotton-seed Oil Cake.—£6 12s. 6d. to £6 15. per ton.

Linseed.—32s. per quarter.

Linseed Oil.—£14 2s. 6d. per tun (252 gallons).

Linseed Oil Cake.—£7 5s. to £7 7s. 6d. per ton.

Olive Oil.—£31 10s. to £65 per tun (252 gallons).

Copra (cocoanut-kernel).—£17 10s. to £17 17s. 6d. per ton.

Cocoanut Oil.—£30 to £34 per ton.

Honey.—Queensland, 17s.; Jamaica, 22s. 6d.; New Zealand, 32s. 6d. per cwt.

Beeswax.—Australian, £7 to £8 per cwt.

Lucerne Seed.—60s. to 65s. per cwt.

Canary Seed.—78s. to 95s. per quarter.

Manilla Hemp.—£35 to £36 per ton.

Sisal Hemp.—New York market, £32 to £36; £32 to £35 in Melbourne market, per ton.

New Zealand Hemp.—£30 to £31 per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—2¾d. to 5d. per lb.

Eggs.—French, 13s. to 17s.; Danish, 10s. to 16s. 3d. per 120.

Bacon.—Irish, 44s. to 51s.; American, 36s. to 44s.; Canadian, 40s. to 45s. per cwt.

Hams.—Irish, 70s. to 106s.; English, 84s. to 100s.; American, 40s. to 46s. per cwt.

Tallow.—Mutton, fine, 29s. 6d. to 25s.; medium, 25s.; beef, fine, 25s. to 25s. 9d.; medium, 23s. to 23s. 6d. per cwt.

Poultry (Smithfield).—Plentiful supplies experienced a rather better demand. Quotations:—Fowls (each): Yorkshire, 2s. 6d. to 3s.; Essex, 2s. 9d. to 3s. 3d.; Boston, 2s. 3d. to 2s. 9d.; Surrey, 3s. 6d. to 4s. 6d.; Sussex, 3s. 3d. to 3s. 9d.; Welsh, 2s. to 2s. 6d.; Irish, 1s. 9d. to 2s. 3d.; turkey—cock, 6s. 6d. to 10s. 6d.; hen, 3s. 6d. to 5s.; geese, 3s. 9d. to 4s. 3d.; rabbits, Australian, 6s. 6d. to 8s. 6d. per dozen; hares, 2s. 3d. to 2s. 9d.; leverets, 1s. 6d. to 2s.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Merino Ewes.)

	Mar 18.	Mar. 25.
Canterbury, light (48 lb. to 56 lb.)	$4\frac{1}{2}$d.	$4\frac{5}{8}$d.
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{4}$d.	$4\frac{3}{8}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	4d.
(Quotations nominal.)		
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{11}{16}$d.	$3\frac{3}{4}$d.
North Island, best	$3\frac{15}{16}$d.	$3\frac{15}{16}$d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$2\frac{7}{8}$d.	3d.
Light (under 50 lb.)	None offering.	$3\frac{1}{4}$d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	$3\frac{1}{8}$d.	$3\frac{3}{8}$d.
Light (under 50 lb.)	$3\frac{3}{8}$d.	$3\frac{5}{8}$d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	$6\frac{1}{8}$d.	$6\frac{1}{8}$d.
Canterbury, heavy (36 lb. to 42 lb.)	6d.	6d.
Dunedin and Southland (28 lb. to 42 lb.)	None offering.	
North Island (28 lb. to 42 lb.) ...	$5\frac{5}{8}$d.	$5\frac{5}{8}$d.

Australian Lambs.

30 lb. to 40 lb., first quality ...	$5\frac{1}{8}$d.	$5\frac{1}{8}$d.
30 lb. to 40 lb., second quality ...	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.

River Plate Lambs.

30 lb. to 40 lb.	$4\frac{3}{8}$d.	$4\frac{3}{8}$d.

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	$2\frac{1}{2}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$2\frac{7}{8}$d.	$2\frac{7}{8}$d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	None offering.	

River Plate Frozen Beef.

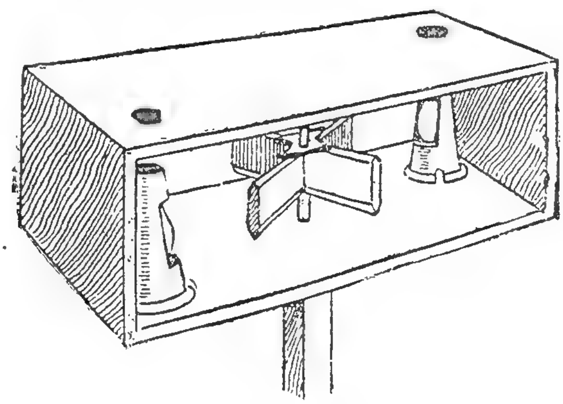
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{5}{16}$d.	$2\frac{5}{16}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$2\frac{9}{16}$d.	$2\frac{9}{16}$d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

A DAY AND NIGHT BIRD-SCARER.

Complaints are made in many parts of the country (Great Britain) of damage done by starlings—which, by the way, are largely on the increase—by other birds, and by vermin. This damage is not only confined to operations by day, but some birds and ground vermin carry on their work of plunder by night. Where such a nuisance exists, an easy method can be adopted for its remedy. By the use of a radiating scarecrow, operated by the wind, beams of sunlight or lamp-light can be flashed over the fields and into the thickets to frighten away birds or animals. The device can be mounted on a post at any convenient place, and once put in operation it is a terror to hawks, crows, and other birds during



the day, and to rodents after sundown. The device consists of a fixed frame of any desired shape, open at two sides for the free passage of the wind, with a lamp at each end for night use. In the centre is a revolving wheel, which carries a number of mirrors to throw reflected flashes of light over the places it is desired to protect. The flanges of the blades should be so shaped as to catch the wind on one side only, so that even the slightest air-current will set it in motion. Any ordinary lamps or lanterns may be used, but it is well to partially protect them with hoods, having polished metal interiors to accentuate the light thrown on the mirrors.—*Farmer and Stockbreeder.*

SOUTH AUSTRALIAN FRUIT FOR THE NATIONAL ASSOCIATION'S SHOW.

At a meeting of the South Australian Council of Agriculture, Adelaide, in February last, Mr. Laffer called attention to the proposed fruit show in Brisbane in August, and thought that as there was an opening for South Australian fruit in Brisbane the State should be represented. He noticed that the Victorian Department had decided to make a representative exhibit. The secretary stated that the Hon. Minister had asked the committee of the South Australian Fruit-growers' Association to co-operate with the Department in the matter of securing a good collection of fruit for the show. The fruit would be held by the Department in cold storage until required for the show. Such an exhibit will be, doubtless, highly appreciated by Queensland fruit-growers and others, and should afford some lessons in the method of packing and getting up fruits for exhibition—not that Queenslanders are a whit behind other States in their grading and packing methods, but we hold that, no matter how perfect one man's methods may be, he always may learn something from studying the ways of others.

A SANITARY FOWL-FEEDER.

In a poultry run where many fowls are kept, an easy method of equally distributing food, and at the same time preserving any surplus quantity in a wholesome condition, may readily be adopted at a little cost. Take a disused cask and cut it in two across the bung-hole, or a wooden pail will do. With pencil and rule draw a mark around the tub, 5 inches from the bottom, and then with a pair of compasses space around the mark, dividing it into the number of sections required, as in Fig. 1. Take a 1½-inch or 2-inch bit and

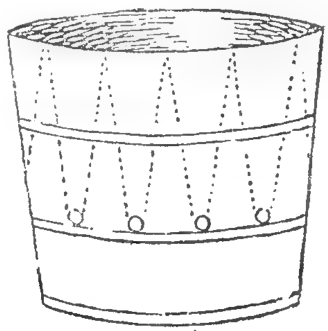


Fig 1

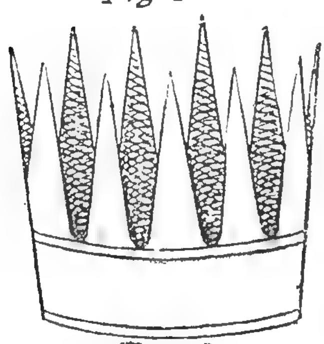


Fig 2

bore holes at every bottom point. Remove the top hoop, and with a fine saw cut out the wood as indicated in Fig. 2. Smooth the edges with a knife, and the feeder is ready for use. If there are a dozen spaces, the number of hens can get around and eat without crowding. These feeders are handy to carry, either empty or full; fowls cannot roost on them, consequently they are always clean; and when not in use they can be stacked up in a corner out of the way. Smaller tubs can be used for chickens.—*Farmer and Stockbreeder.*

COTTON, PAPAW JUICE, AND KOLA NUTS.

The prices for these three articles, which can be grown to perfection in Queensland, are given as follow, in the *Agricultural News*, Barbados:—

The highest point of the market for American cotton during the year was on 2nd February, when middling American was quoted 8.96d. per lb., and the lowest point, on 29th December, when it was quoted at 3.63d. per lb. The average value for middling American for the year is 6.6d. per lb. (Liverpool Cotton Association "Annual Circular.")

Monserrat good quality papaw juice is worth 10s. per lb.

Kola nuts maintain a steady price. Extra bold, bright, washed West Indian sold at 4½d. per lb. They are also quoted at 6d. per lb., but the average price appears to be 3½d. per lb.

SISAL HEMP AT BARCALDINE.

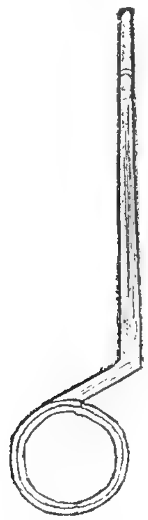
Any doubts which the advocates of the establishment of the sisal hemp industry in Queensland may cherish as to the suitability of the Western country for the sisal plant would be entirely dispelled were they to see the manner in which it grows all over the Central district. The accompanying illustration shows a clump of the *Agave rigida, var. sisalana*, growing in a corner of Mr. H. H. E. Peut's backyard. The plants were put in some years ago, and have not only received no cultivation, but have been ill-treated by fires close to them and doses of boiling water on washing days. The leaves of most of the plants are 6 feet in length. The whole of this Western country is admirably

adapted to the successful growth of the plant. Fears are expressed about frost, but plants have been growing for years in the West, and have never been injured by frost. At Goondiwindi, on the Macintyre River, on the borders of Queensland and New South Wales, some splendid specimens are to be seen; yet very heavy frosts occur there. Those who are fortunate enough to obtain the land in the Central district on which sisal hemp is about to be planted by the Government will have no reason to regret it, as there is good money even in 5 to 10 acres of the plant. In the next issue of the *Journal* we propose to give an account of the fluctuations in the price of sisal fibre for the past twenty-five years, a perusal of which should afford great encouragement to planters in this State.

REMOVING "PEAS" FROM COWS' TEATS.

Among the inventions of the past years (says "Vet." in the *Farmer and Stockbreeder*) may be counted a very promising little instrument for the removal of "peas" from the channels of cows' teats. It will need some manipulative skill to use it, or the lining membrane may be injured and induce further growths, but in the hands of a careful operator should fulfil its designer's purpose. Mr. H. A. Barret, M.R.C.V.S., of Nuneaton, is the patentee, and Huish and Co. the agents. It is an ordinary bow director (see illustration) slightly tapering and hollow-grooved except at the end which is blocked. The edges are moderately sharp. The method of employment is as follows:—Anoint the instrument with an antiseptic ointment, as boracic acid, pass it right up the teat, and, having directed the "pea" or nodule into the hollow,

compress with the finger and thumb of one hand, while slowly but forcibly turning it so as to cut away the obstacle, and leave it in the groove, from which it should not escape, owing to the blocked-up end previously described. When withdrawn, the "pea" should be found in the groove. Mr. Barret



PAPILLATOME

recommends reintroducing the instrument, anointed a second time with the antiseptic. The writer of this note thinks a still better practice is to dress an ordinary milk syphon with the boracic ointment, and secure it in the teat for a day or two, as there is a disposition to contraction if the wound heals without some pressure and distension of the channel.

SISAL HEMP IN HAWAII.

The sisal industry on these islands is rapidly extending. At Ewa, the Hawaiian Fibre Company is about to increase its planted area from 750 acres to 1,000 acres. Every encouragement is being offered by the large sugar-planting companies on Maui to the settlers to plant sisal. The price of cleaned fibre in New York is now from £32 to £35 per ton.*

Messrs. Riebow, of Hamburg, experts in the fibre trade, quote Mauritius hemp—*i.e.*, fibre of the *Fourcroya*, usually called aloe fibre—at from £30 to £32 per ton. The Murva fibre, a very silky fibre, produced from the *Sanseviera* plant, which grows in Queensland like a weed wherever planted, is quoted at £50 per ton. The fibre is extracted from the leaves with even greater facility than in the case of sisal hemp. The fibre of the *Agave americana*, which may be seen growing in many parts of Queensland, is very valuable. The leaves of this aloe grow to a length of 5 or 6 feet here. They are thick, grey-green in colour, with, in some varieties, ornamental white edges. In Singapore, fibre extracted from this plant by Mr. Shirmer's Hogan machine was valued at from £30 to £40 per ton, according to length. The out-turn from this variety per acre in India is from 40 to 70 tons of leaves, giving 1½ tons of fibre.

* According to the *Hawaiian Forester and Agriculturist*, the Hawaiian Sisal Co. estimates the future cost of producing a ton of sisal hemp and delivering it in San Francisco at 74 dollars. At the latest New York quotation of 165 dollars per ton, it is evident that there are prospects of excellent profits.

Answers to Correspondents.

PINEAPPLE, GRAPE, AND MANGO WINE.

As far as mangoes are concerned, we have not been able to meet with anyone who has tried making the fruit into wine. By grape wine we presume you mean preserving the juice. Wine-making from grapes is a very elaborate business, but you can make a fair wine by just crushing the grapes in an earthenware vessel or wooden tub (a zinc tub must not be used). Allow the juice to ferment on the lees. When fermentation ceases, let the liquor in the cask or keg settle for a few days, then draw off into another vessel. Let it remain there for a couple or three months, until sediment no longer forms. The wine will then be drinkable, but if made for sale should be allowed to age.

Grape Juice.—Use only sound, ripe grapes. Put the grapes (crushed by hand) in a clean-washed cloth sack and tie up. Twist, if you like to hurry the process, till the greatest part of the juice is extracted. Then gradually heat the juice in a double boiler or large stone jar in a pan of hot water to about 180 or 200 degrees, never higher. If you have no thermometer, heat till it steams but does not boil. Put the juice to settle in an enamelled vessel. Carefully drain the juice from the sediment, and run it through a filter of several thicknesses of clean flannel. Then fill into clean bottles. Do not fill the bottles entirely, but leave room for the liquid to expand when heated. Fit a thin board over the bottom of an ordinary wash boiler. Set the filled bottles on it, and fill with water to within an inch of the tops. Gradually heat the water till it simmers. Take the bottles out then, cork and seal *immediately.* It must be used as soon as a bottle is opened, because what is left will ferment.

Pineapple Wine.—Over the peelings of two pinapples pour 1 quart of boiling water; allow it to steep till cold; then sweeten to taste, strain, and bottle. Tie down the cork, and place the bottle on its side. If put in a warm place, it will be ripe in twenty-four hours. A small piece of ginger placed in each bottle will improve the flavour. If made in large quantities, the whole pineapple chopped should be used.

TO KEEP WEEVILS OUT OF SACKED GRAIN.

Tie a ball of tow to a stick long enough to reach the centre of the sack (or tank). Soak the tow with bi-sulphide of carbon. Plunge it *at once* into the sack or tank, and leave it there. Close the sack tightly. One ounce of bi-sulphide is sufficient for 2 bushels of grain. In the case of bags, renew the chemical occasionally. Be careful about lights when using bi-sulphide, as it is highly explosive.

ONION-GROWING.

Herbert Sydney, Taabinga Village, Nanango.—

1. The land for onions should be reduced to a fine tilth. Two items you mention will be unfavourable to your getting a good crop. The first is, that you have brought up a tough subsoil; and the second, that it cannot be reduced to anything smaller than lumps 4 inches square. If you cannot get a fine tilth, we would not lead you to expect a good crop.

2. Drills should be 12 to 15 inches apart, and the plants thinned out to 6 inches apart. Whether in the seed bed or in the field, the seed must not be covered much more than their own diameter. If sown deep, many will not germinate, and others will make an abnormal growth at the neck.

3. If you have no drill, use a wooden marker like a corn-marker. It will quite answer the purpose.

TO DESTROY WEEVILS IN A BARN.

Farmer.—Salt is a protective agent. This was accidentally discovered by a farmer. He stacked up some grain in an odd lot of sacks, some of which had contained salt, and salt grains were still clinging to them. When the grain was marketed, that in the salt sacks was perfectly free from weevils, that in the others was riddled by them. He always used salt after this in his barn. When the unhusked corn was piled up in the barn, he dissolved a quart of salt in 2 gallons of water, and sprinkled the corn as it was thrown in. No weevils touched it, although the barn was full of weevils previously.

PARALYSIS IN PIGS.

Enquirer, Gympie.—

Mr. H. V. Cory, M.R.C.V.S., says:—Paralysis of the fore limbs is rare in pigs, although of common occurrence in the hind limbs. It may be brought about by various causes, such as disease of the spinal cord or nerves supplying the muscles of the affected part. The presence of parasites in the body such as the *Stephanurus dentatus*, which is found in and around the kidneys, poisons, such as lead, poisonous plants, seed, &c., is often the cause. A positive diagnosis can only be made by carefully examining the animal, and, when the cause is found, treatment must be accordingly. I am of opinion that in this case the affection is brought about by excessive rich food and want of exercise. Therefore, I would suggest that the daily diet be somewhat restricted for a few weeks, particularly the corn. No corn should be given if mouldy. Allow the animal exercise if it can take any, and give occasionally a dose of laxative medicine such as—castor oil, 2 oz.; or Epsom salts, ½ to 2 oz. Massage of the affected parts will be beneficial.

SISAL HEMP LAND.

Enquirer, Oxley.—There is no difficulty in finding land perfectly well adapted for sisal hemp growing in your own district. Presumably the high price of land about Sherwood, Corinda, Oxley, Darra, &c., is what prompts your inquiry about Mount Gravatt country. There is a very large area of land in that district, nearly all, we believe, in private hands. Whilst there are small portions of land suitable for cultivation, the greater part is dry, sandy, and gravelly, besides being heavily timbered. Beyond Mount Gravatt and on towards Beenleigh, Mount Cotton, and the Broadwater, there is an immense area of timbered country which would suit your purpose. The land would not require to be stumped, but the trees would have to be felled and burnt off. Ringing them would not be sufficient, as the falling branches from the dead trees would do much damage to the sisal plants. The land is well watered in parts by creeks and waterholes. Why not go out and look at the land, and see what is being done in the way of growing sisal hemp at Brown's and Cooper's Plains, and at the Broadwater? Prices for land vary from £1 to £5 per acre.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Prices.
Apples, Eating, per packer, Victorian	4s. to 8s.
Apples, Eating, per packer, Tasmanian	3s. 6d. to 5s.
Apples, Cooking	6s. to 7s.
Apples, Local	2s. 6d. to 4s.
Apples, American, Green	...
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, Sugar, per bunch	3d. to $10\frac{1}{2}$d.
Bananas, Cavendish, per bunch	3d. to 1s.
Bananas, per dozen	$1\frac{1}{2}$d.
Cape Gooseberries, quart	...
Cherries, quarter-case	...
Custard Apples, quarter-case	3s. to 4s.
Grapes, per lb.	$3\frac{1}{2}$d. to 4d.
Granadillas, case	...
Gooseberries, English	...
Lemons, American, per case	9s. to 10s. 6d. to 14s.
Lemons, Local	6s. to 7s. to 8s.
Lemons, Italian, per case	...
Lemons, Italian, per 180	...
Loquats, half-gincase	...
Mandarins, Local	4s. 6d. to 6s.
Mandarins, Bowen	...
Mangoes, half-case	...
Mangoes, good, half-case	...
Melons, per dozen	...
Nectarines, quarter-case	...
Oranges, Italian, per 180	...
Oranges, American	9s. to 10s. 6d.
Oranges, Sydney (packers)	...
Passion Fruit, quarter-case	2s. to 3s.
Papaw Apples, per case	...
Peanuts, per lb.	...
Pears, Victorian, quarter-case	7s. 6d. to 9s. 6d.
Pears, Tasmanian, quarter-case	3s. 9d. to 4s. 6d.
Persimmons, quarter-case	3s. to 4s.
Pineapples (rough leaf), per dozen	1s. to 3s.
Pineapples (smooth leaf), per dozen	3s. to 4s.
Plums, Black, quarter-case	3s. to 5s.
Plums, Light, quarter-case	2s. to 3s. 6d.
Plums, American, per 108's	...
Quinces, quarter-case	1s. 6d. to 3s. 6d.
Rosellas, per sugar-bag	...
Tomatoes, quarter-case	1s. to 1s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH.

Article.		MARCH. Prices.
Bacon (Pineapple)	lb.	$4\frac{1}{2}$d. to 5d.
Barley, Malting	bush.	3s. to 3s. 3d.
Bran	ton	£3 15s.
Butter, Factory	lb.	$7\frac{3}{4}$d. to $8\frac{1}{2}$d.
Chaff, Mixed	ton	
Chaff, Oaten	„	£3 9s. to £4 15s.
Chaff, Lucerne	„	£2 1s. to £3 to £3 5s.
Chaff, Wheaten	„	£1 15s.
Cheese	lb.	3d. to $4\frac{1}{2}$d.
Flour	ton	£8 10s.
Hay, Oaten	„	£5 10s.
Hay, Lucerne	„	£1 10s. to £2 5s.
Honey	lb.	1d. to $1\frac{1}{4}$d.
Maize	bush.	2s. 3d. to 2s. 4d.
Oats	„	2s. 3d. to 3s. 8d.
Pollard	ton	£4 10s.
Potatoes	„	£7 7s. 6d. to £8 5s.
Potatoes, Sweet	„	£3 to £3 10s.
Pumpkins	„	
Wheat, Milling	bush.	3s. 3d. to 3s. 6d.
Wheat, Chick	„	2s. 6d. to 2s. 10d.
Onions	ton	£11 5s. to £11 10s.
Hams	lb.	$9\frac{1}{2}$d.
Eggs	doz.	8d. to $11\frac{1}{2}$d.
Fowls	pair	2s. to 3s.
Geese	„	4s. 3d. to 4s. 6d.
Ducks, English	„	1s. 9d. to 2s. 6d.
Ducks, Muscovy	„	2s. 6d. to 3s. 6d.
Turkeys, Hens	„	4s. 6d. to 5s. 3d.
Turkeys, Gobblers	„	7s. to 9s. 6d.

ENOGGERA SALES.

Animal.	JANUARY. Prices.	FEBRUARY. Prices.
Bullocks	£7 15s. to £10	£7 10s. to £8 10s.
Cows	£6 5s. to £6 17s. 6d.	£6 10s. to £7 10s.
Wethers, Merino	17s. 9d.	...
„ „ (Woolly)	23s. 6d.	19s.
„ C.B.	21s.	20s. 3d.
Ewes, C.B.	20s. 6d.	16s. 9d.
„ Merino	15s.	14s. 3d.
Lambs	17s. 3d.	15s. 3d.
Pigs, Baconers	...	40s.
„ Porkers	20s. 6d.	25s.

Orchard Notes for April.

By ALBERT H. BENSON.

The Orchard Notes for March dealt largely with citrus fruits, especial attention being drawn to the importance of taking every precaution, now that the fruit is reaching maturity, for preventing its destruction by the various pests that attack the ripening fruit. At the same time, I pointed out the necessity for the proper handling, sweating, and packing of the fruits, in order that it shall be placed on the markets either of this or the other Australian States in the most attractive manner and best possible condition. All that I stated in last month's Notes applies with equal force to the present month, and in fact as long as the citrus season continues, so that I need not repeat what I then wrote, but will simply draw the attention of all citrus-growers to the importance of my remarks, as it is useless to take every care throughout the year to keep the trees well pruned and free from disease and the orchard in a high state of cultivation if we do not do our best to protect the result of such work and to market it to the best advantage.

With the exception of the marketing of citrus and a few other fruits—such as persimmons, pines, bananas, custard apples, &c.—April is a somewhat slack time for fruit-growers, especially those who depend on deciduous fruits, so that the opportunity should be taken to clean up the orchard before winter, and to finish up any odd jobs that have been neglected during the previous months. Such work will consist of looking after all fences, drains, headlands, &c.; the casting back of soil round trees where same has been washed away by the heavy summer rains; the ploughing in of all weeds and trash that have accumulated in the orchard during the wet season; the removal of all dead or worthless varieties of trees that it is desirable to get rid of; and any other work—such as the collection of material for and making of compost heaps—that may be necessary.

Cyaniding for all kinds of scale insects may be continued during the month, taking care not to treat any trees bearing fruit when same is either wet with rain or heavy with dew, as, if treated under these conditions, the fruit is apt to be marked.

Strawberry-planting can be continued during the month, but the planting of all kinds of fruit trees should be delayed till the wood has been thoroughly matured. Keep the nursery clean, see that all young buds are growing properly, and that all unnecessary shoots are removed; the young tree being trained to one straight stem till high enough to form the future head of tree, when it should be topped.

Orchard Notes for May.

By ALBERT H. BENSON.

The hints given in the notes for March and April on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in a raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month, slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable manure for citrus and other trees in many soils; as, though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the State it is better to wait longer, as the leaves are not off and the sap is not down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands, subject to light frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apples, &c., so as to destroy the larvæ of any fruit flies or peach moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Farm and Garden Notes for April.

Field.—The maize crop should now all be harvested. Gather sorghum seed as it ripens. The main potato crop, sown in February and March, will be ready for earthing up a first or a second time. Cut and house tobacco as it comes to maturity. Sow lucerne, and keep thoroughly clean what was sown last month. Sow oats, barley, rye, vetches, mangels, and Swede turnips. April, May, and June are the months for sowing early and late wheat. Whatever variety is sown should be dipped in a solution of bluestone (sulphate of copper), at the rate of 1 lb. bluestone to 24 gallons of water. The hot water treatment, as previously described in this *Journal*, is effective in destroying germs of smut and similar fungoid diseases. Do not sow too thickly. About half a bushel to the acre is sufficient, more on poor land and less on rich soils where the wheat is inclined to stool. On light, sandy soil the wheat should be rolled. On sticky land be cautious and roll only when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 inches high, go over it with light harrows. If the autumn and winter should prove mild, and the wheat should lodge, it should be kept in check by feeding it off with sheep. Any land not ready for wheat should be got ready as soon as possible. Those who are already growing cotton will require to give the crop attention, as the pods will now be bursting. Picking should be done as soon as the dew has dried off—not before. Transplant roots of *Paspalum dilatatum*.

Kitchen Garden.—Keep the weeds down amongst the crops, and prepare well-dug, well-manured beds for transplanting the various vegetables now coming on. Thin out all over-crowded crops. Divide and plant out pot-herbs, giving a little water, if required, until established, after which be more sparing in the use of water. Sow broad beans, peas, onions, radishes, mustard, cress, and all vegetable seeds generally. In dry weather, earth up celery, being careful to prevent the soil getting between the leaves. Hold the leaves in one hand and earth up with the other. Fill up occasionally, and your celery will be ready in about two months. Transplant cauliflowers and cabbages. Keep on hand a supply of tobacco waste, preferably in the form of powder. When slugs appear, place a ring of this round your plants, and they will be then as impregnable to the slug as the strongest fortification to an attacking force. Also water occasionally with a solution of 1 part decoction of tobacco to 10 parts of water. As an instance of the efficacy of dry tobacco leaf stems, the following will be ample proof:—An amateur vegetable-grower, finding that in December last the great vaginula slug had begun to make nocturnal attacks on his young cabbages, obtained a quantity of leaf stems and placed them round each plant. Next morning there were three large black slugs lying dead about a foot from the plant, and another had just reached the nearest plant-stalk when death interrupted the meal almost begun.

Flower Garden.—Work early and late to keep down weed-growth. Sow all the annuals recommended for last month, and you will find the seedlings come in very handy later on. Those already up will keep you busy pricking them out into other beds or into their permanent positions. Growth will not be too luxuriant just now, and shrubs and creepers may be shortened back. Plant out shrubs of all sorts in well-drained spots. Do not dig pot-holes in which the first good rains will form stagnant pools. Always dig your flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really choice flowers or vegetables should have a dressing of bone-meal lightly turned in. Wood ashes also form excellent dressing for the garden soil. Prune out your roses. Whatever you may be told to the contrary, roses, if well-grown and hard, may be planted out now with perfect success. Take up dahlia roots and plant bulbs as recommended for March.

Farm and Garden Notes for May.

FIELD.—The principal work in the field this month will be the sowing of wheat, barley, oats, rye, and vetches. If sowings have not been already made, there is no time to lose. See that all potatoes are hilled up. Cut tobacco. Those who have cotton growing should be picking the last of the crop. Strip the bushes daily after the dew has evaporated, and spread out the cotton to thoroughly dry in the sun before bagging. Prepare for the winter feeding of stock by utilising all kinds of green stuff, either in the silo or in the stack. Every agriculturist who has a dairy herd should aim at laying down permanent grasses suitable to the climate and to the district in which he lives. A few acres of artificial grass will support a surprisingly large number of cattle in proportion to acreage. A farmer at Barcaldine fattens 12 sheep to the acre on couch grass. Coffee-picking should now be in full swing. The berries should be pulped as they are picked. Strawberries may now be transplanted. Trollope's Victoria, Marguerite, Hautbois, Aurie, and Pink's Prolific are good varieties. The Aurie is the earliest, and the Marguerite next. In some localities, strawberry-planting is finished in March, and the plants begin to bear the first week in August.

KITCHEN GARDEN.—Onions which have been grown in seed beds may now be transplanted. The ground should have been thoroughly cleaned, pulverised, and rolled beforehand. Onions may still be sown in the open, on thoroughly clean ground. In favourable weather, plant out cabbages, cauliflowers, lettuce, leeks, beetroot, &c. Sowings may also be made of all these in addition to peas, broad beans, kohl rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus. Choose the best soil, which is a deep, sandy loam, dug 18 inches deep and well manured, a good sprinkling of salt being added a month before the planting season. Then peg out the beds 4 feet wide, leaving a path 2 feet wide on each side of the bed. Plant 4 rows in each bed, the front rows 9 inches from the side; cover the crowns at least 3 inches with good loose soil and manure mixed; rake to a smooth surface. The plants must be 15 inches apart. For old beds, cut the stalks down in May; dig the beds lightly over with a fork, and lay over them a good dressing of manure. In September you may begin to cut. You may ensure the blanching of the tender shoots by placing earthen pipes or bamboo joints over them.

FLOWER GARDEN.—During showery weather, planting and transplanting may be done at once, as the plants will be established before the frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady place out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, iris, narcissus, &c. Tulips and hyacinths may be tried, but success in this climate is very doubtful. All shades and screens may now be removed, to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Publication Received.

"THE TROPICAL AGRICULTURIST AND MAGAZINE OF THE CEYLON AGRICULTURAL SOCIETY."

Nearly a quarter of a century ago the Hon. J. Ferguson, C.M.G., and Mr. A. M. Ferguson launched on the sea of agricultural literature the monthly periodical *The Tropical Agriculturist*, a publication especially devoted to various tropical industries, such as tea, cinchona, cocoa, coffee, palms, cacao, rubber, and, *inter alia*, to bee-keeping and minor country industries. The good work done by this, the best periodical dealing with such subjects with which we are acquainted during the past twenty-four years, is to-day evidenced in the wonderful extension of tropical industries in Ceylon, particularly of tea, rubber, cocoa, cardamoms, &c. The labours of the enterprising proprietors and their coadjutors are embodied in twenty-three complete volumes, which are, and many a long day will be, invaluable as works of reference on all such industries as we have named. We have been for several years indebted to its pages for much information which has been of great value to the tropical and semi-tropical planters of Queensland, and its teachings will, we trust, continue to bear good fruit, as we learn that the journal has now been handed over to, as the late proprietors modestly put it, "truly scientific, younger, and far more capable hands—the newly-formed Ceylon Agricultural Society." Dr. Willis, the director of the Peradeniya Royal Botanic Gardens, now assumes the editorial charge of the new issue, to be called henceforth "The Tropical Agriculturist and Magazine of the Ceylon Agricultural Society." Meanwhile, all correspondence or contributions should now be addressed to the Editor, Royal Botanic Gardens, Peradeniya. In the words of the announcement by the late proprietors, "we speed the parting and welcome the coming guest."

Times of Sunrise and Sunset, 1905.

DATE.	APRIL.		MAY.		JUNE.		JULY.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·59	5·46	6·14	5·16	6·32	5·0	6·40	5·4
2	5·59	5·45	6·14	5·15	6·32	5·0	6·40	5·4
3	6·0	5·44	6·15	5·14	6·32	5·0	6·40	5·4
4	6·0	5·43	6·15	5·13	6·32	5·0	6·40	5·5
5	6·0	5·42	6·16	5·13	6·33	5·0	6·40	5·5
6	6·1	5·41	6·17	5·12	6·33	5·0	6·40	5·5
7	6·1	5·40	6·17	5·12	6·34	5·0	6·40	5·6
8	6·2	5·39	6·18	5·11	6·34	5·0	6·39	5·6
9	6·2	5·38	6·18	5·11	6·35	5·0	6·39	5·6
10	6·3	5·37	6·19	5·10	6·35	5·0	6·39	5·7
11	6·3	5·36	6·19	5·10	6·35	5·0	6·39	5·7
12	6·4	5·35	6·20	5·9	6·35	5·0	6·39	5·7
13	6·4	5·34	6·20	5·8	6·36	5·0	6·39	5·8
14	6·5	5·33	6·21	5·8	6·36	5·0	6·39	5·8
15	6·5	5·32	6·21	5·7	6·36	5·0	6·38	5·9
16	6·6	5·31	6·22	5·7	6·36	5·0	6·38	5·9
17	6·6	5·30	6·23	5·6	6·36	5·0	6·38	5·10
18	6·7	5·29	6·23	5·6	6·36	5·1	6·37	5·10
19	6·7	5·28	6·24	5·5	6·36	5·1	6·37	5·11
20	6·8	5·27	6·25	5·5	6·37	5·1	6·36	5·11
21	6·8	5·26	6·25	5·4	6·37	5·1	6·36	5·12
22	6·9	5·25	6·26	5·4	6·37	5·1	6·35	5·12
23	6·9	5·24	6·26	5·3	6·37	5·2	6·35	5·13
24	6·10	5·23	6·27	5·3	6·38	5·2	6·34	5·14
25	6·10	5·22	6·27	5·2	6·38	5·2	6·34	5·14
26	6·11	5·21	6·28	5·2	6·38	5·2	6·33	5·15
27	6·11	5·20	6·28	5·1	6·38	5·2	6·33	5·15
28	6·12	5·19	6·29	5·1	6·39	5·2	6·32	5·16
29	6·13	5·18	6·30	5·0	6·39	5·3	6·32	5·16
30	6·13	5·17	6·31	5·0	6·39	5·3	6·31	5·17
31	...	...	6·31	5·0	...	...	6·31	5·17

PHASES OF THE MOON.

			H.	M.
5 April	●	New Moon	9	23 a.m.
13 "	☾	First Quarter	7	41 "
19 "	○	Full Moon	11	38 p.m.
26 "	☽	Last Quarter	9	14 "
5 May	●	New Moon	1	50 a.m.
12 "	☾	First Quarter	4	46 p.m.
19 "	○	Full Moon	7	36 a.m.
26 "	☽	Last Quarter	12	50 p.m.
3 June	●	New Moon	3	57 p.m.
10 "	☾	First Quarter	11	5 "
17 "	○	Full Moon	3	52 "
25 "	☽	Last Quarter	5	45 a.m.
3 July	●	New Moon	3	50 a.m.
10 "	☾	First Quarter	3	46 "
17 "	○	Full Moon	1	32 "
24 "	☽	Last Quarter	11	9 p.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1905.		ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
		Rise.	Set.	Rise.	Set.	Rise.	Set.
April	...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.
May	...	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	...	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	...	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.

Plate XVIII.

1.—Queensland Lambs. 2.—New Zealand Lambs.

Agriculture.

LAMBS FOR EXPORT.

Comparatively a short time ago, Queensland farmers began to systematise the dairying industry, which previously had been carried on in a desultory manner, each farmer making and selling his own butter under good, bad, or indifferent conditions. To-day that industry has expanded enormously. Butter factories and creameries have multiplied throughout the land, and the expansion is still proceeding. In the same way we may expect that the breeding of lambs for export will develop into a most important industry, provided the lambs are of a class to suit the London market. Since the trial shipment to London of frozen lambs by the New Zealand Loan and Mercantile Agency Company from Brisbane by the ss. "Dorset," attention has been directed to this branch of the pastoral and farming industry. Mr. J. Macdonald, manager of the above company, informs us that he visited Mr. F. G. G. Couper, at Westbrook, and found that he had just imported some seventy purebred Leicester ewes and rams from New Zealand, with the view of commencing a stud flock for the purpose of utilising same to obtain the best lambs for export. Mr. Couper pointed out that, although it seems to be the feeling at present in Queensland that Shropshire rams are the best to cross with merino ewes to obtain such lambs, the actual position in New Zealand is, that Leicester rams are in much greater demand there than Shropshires. Mr. Couper, it should be mentioned, is a New Zealand pastoralist, and well up in the frozen export business.

The shipment of 500 frozen lambs above referred to was consigned by the New Zealand Loan and Mercantile Agency Company on account of Mr. Couper; and the results, notwithstanding adverse conditions on the home voyage, were such as to give every reason to believe that the frozen lamb industry will become a most important one in this State, and offers great encouragement not only to pastoralists, but to farmers in districts where sheep-breeding is likely to succeed, to devote their attention to this branch of industry. We have, in this State, tens of thousands of acres of such country, and those who are acquainted with the Jemalong sheep-feeding experiments by Mr. Gatenby will doubtless find it profitable to utilise their lucerne fields or lay down large areas of lucerne for sheep-feeding. There appears to be no shadow of doubt from the verdict of the experts in connection with the "Dorset" shipment that, if regular shipments of such carcasses as comprised it can be sent from Queensland, they will soon make a reputation, and be as eagerly sought for as are the New Zealand Canterbury lambs at the present time.

Mr. Macdonald has kindly forwarded us the two photographs here reproduced. No. 1 represents three ordinary lambs, typical of the "Dorset" shipment, and No. 2 shows three ordinary Canterbury (New Zealand) lambs.

A Smithfield report, forwarded to the *Brisbane Courier* by that journal's London correspondent, states:—

"As a means of testing the London market, so far as prices are concerned, the value of the consignment of 596 lambs despatched from Brisbane in the steamer 'Dorset' was somewhat diminished by damage which the meat suffered during the steamer's homeward voyage of seventy-nine days. Where and how the damage occurred has not yet been ascertained, but some of it is supposed to be a result of the interruption of the voyage at Capetown. It is stated that the hold of the vessel was kept open there for some time during the discharge of frozen cargo for South African importers. The London consignees, the New Zealand Loan and Mercantile Agency, state that the allowance of insurance money for the injury done is 'considerably above the

average' in such cases. In spite of the misfortune of this comparative failure in transport—which was not, however, so serious as to lead to the condemnation of any of the meat by the health authorities—it was easy to judge the general character of the consignment, and estimate its quality at the time of shipment. The different sizes of lambs were graded as follow:—A, 396 carcasses, averaging 31.7 lb.; B, 136 carcasses, averaging 38 lb.; L, 44 carcasses, averaging 26.6 lb.; H, 20 carcasses, averaging 45 lb. The New Zealand Loan Company's market expert, Mr. Godfrey Phipps, describes the quality of the several parcels as follows:—

'The A grade were all well formed, compact, fully developed, not too long in the bone (as are many of the lambs received in the regular Australian supplies), and in general appearance well suited to the London market. They showed a trace of the Shropshire-Down breed.

'Those in the B grade were exceptionally choice, and compared most favourably with the best New Zealand lambs. I have no doubt that if regular shipments of such carcasses could be sent from Queensland, carefully chosen as a special class, they would soon make a valuable name, and perhaps be widely sought after as the Canterbury lambs are. The effect of reputation on prices is, of course, always pronounced in the markets of this country. I have often seen North Island lambs at Smithfield which were distinctly better in quality than "Canterbury," but the latter, being the better known, realised higher prices. The L grade lambs were of good quality for a light-weight lamb, but were not sufficiently developed. They would have made a better show if they had been kept on the grass a little longer. In my opinion no lambs should be sent here from Queensland under an average of 28 lb. The range of weights should be from 28 lb. to 45 lb. I have seen lambs of 50 lb., but most butchers are inclined to regard carcasses exceeding 45 lb. with doubt. The H grade carcasses in the Queensland consignment are of the class known as "tegs." The term is genrally used to indicate the dividing line between lamb and mutton. They are choice, well-matured lambs, not leggy, and showing the characteristics of the Shropshire-Down breed.'

"Another expert, a meat surveyor, who is constantly reporting upon Australian and other shipments, also stated that the Shropshire strain was marked in the consignment. As far as he could judge, the lambs, or the majority of them, represented a 'second cross' of the Shropshire and merino breeds, which he thought a good blend for the purposes of the meat trade. The consignment is in store awaiting sale. Mr. Phipps expects that the prices which can be obtained will, notwithstanding the damage done to the lambs in transit, be little if anything below the average realised by the ordinary New South Wales and Victorian meat."

The price obtained for the frozen lambs per "Dorset" ranged from 5d. per lb. downwards, according to condition.

During his late visit to the Southern States, the Under Secretary for Agriculture, Mr. E. G. Scriven, made special inquiries into the business of the export of frozen lambs. In his report he says:—

The breeding of lambs for this purpose is generally upon the same lines in the several States. In New South Wales the direct cross of a Shropshire and merino is favoured. Victoria follows suit, but South Australia has different ideas. The breeds of sheep used in the production of lambs for export are large-framed merino ewes or the first cross therefrom.

These are mated with Shropshire, Lincoln, South Downs, or Dorset, the breeds being valued in the order in which they are given. The Shropshires are used to the greatest extent, then Lincoln, and but a few South Downs or Dorsets. The Dorsets are, however, advancing in favour, and when obtainable at reasonable rates will be largely used. In wet lands the Romney Marsh ram is in demand, and the lambs from the cross are said to be of a high quality. During 1904 some 200,000 lambs were exported from South Australia, for the most part by big companies, but many farmers shipped on their own account

through the Produce Export Department, and realised satisfactory prices, varying from 12s. 6d. to 16s. per head, at an average weight of 36 lb. The Director of Agriculture recommends a trial of a merino crossed by a Hampshire Down, a cross that he found to pay well in Great Britain for the lamb trade.

So that the names and addresses of people who are breeders of rams at reasonable prices may be available for those in Queensland who are buyers of this stock, the following list may be of service:—

SHROPSHIRES.

South Australia.—Sir S. J. Way, Kadlunga, Mintaro; S. S. Ralli, Werocata, Balaklava; Richard Smith, Sweetholm, Strathalbyn; Eversley Thomas, Watulunga, Strathalbyn; G. Sauerbier, Wickham Park, Kangarilla; W. Richardson, Waringa, Menigle; G. A. Maidenment, Everleigh, Ashbourne; L. R. Wake, Gum Park, Red Hill; T. R. Reynolds, Glenwood, Williamstown; H. N. Thomas, Highlands, Auburn.

New South Wales.—Cooper and Nephews, Quambone, Coonamble; Conroy and Doyle, Glenlee, Campbelltown; F. A. Parbury, Satur, Scone; Barrett and Melrose, Burrengong, Young; W. R. Hindmarsh, Alnwick; Robertson; P. W. Jenkins, Nimitybelle; A. H. Wright, Tombong; Cutler Bros., Bathurst; H. F. Marr, Redgate, Moss Vale; P. W. Jenkins, Clifton, Cooma.

Tasmania.—G. W. Piersse, Braeside; Brain Bros., Daisy Park; Burbury Bros., Inglewood, Andover; G. Simonds, Stonor.

New Zealand.—Coates Bros., New Zealand; Rupert Parry, Timaru; W. Grant, Timaru; W. Gardiner, Cliff Island; H. Edwards, Ngapara.

Victoria.—Estate of Mrs. Matthews, Lancefield.

SOUTHDOWN.

South Australia.—G. Sauerbier, Wickham Park, Kangarilla.

New South Wales.—Dunkley and Mallinson, Dunkeld; Cutler Bros., Bathurst; Charles Boyd, Rainham, Bathurst.

LINCOLNS.

South Australia.—C. H. Angas, Callingrove, Angaston; P. Charley, Narrung; W. Richardson, Dalveen, Woodchester; J. Grundy, Glenbracken, Second Valley.

New South Wales.—J. A. Wallace, Charleville, Cadia; J. D. Hill, Bogalara, Bookham; L. E. Wiseman, Elmswood, Scone; F. A. Parbury, Satur, Scone; T. A. Fawcett, Glenridding, Singleton.

DORSET.

South Australia.—P. Lawson, Appilta, Yarrowie; J. Melrose, Ulooloo.

ROMNEY MARSH.

South Australia.—E. E. Feverhardt, Lucindale.

New South Wales.—F. R. C. Hopkins, Errowanbang, Carcoar; J. D. Hill, Bogagra, Bookham; Dunkley and Mallinson, Dunkeld.

The prices vary between 4 and 10 guineas, but it is understood that prime rams for breeding for export can generally be purchased at from 6 to 8 guineas.

POTATO SCAB.

The prevalence of potato disease in parts of Australia and New Zealand has necessitated great vigilance on the part of the Queensland Government to prevent its introduction into this State. The small importations of some of the new varieties of disease-proof English potatoes, such as Northern Star, Sir John Llewellyn, Up to Date, Evergreen, &c., have not yet had time to increase sufficiently to place the seed on the market in any quantity, but it will not

be long before the increase will enable farmers to obtain, at reasonable prices, seed which, if we are to believe the reports of the English journals, is disease-proof, and which will double the yield per acre, given fair seasons. On the subject of the disease known as potato scab, the journal of the Board of Agriculture, London, writes:—

At the present day potato scab *(Oospora scabies)* is one of the most widespread of diseases affecting the potato. The fungus usually attacks the tubers while young, forming scattered rough patches or scabs on the surface; these patches gradually increase in size and number, and not infrequently, when the tuber is full-grown, its surface is more or less completely covered with scab. The injury is confined to the surface of the tuber, the skin being broken up into fragments over the diseased patches. Although the market value is much depreciated when scab is present in quantity, the quality of the potato is not in the least impaired for eating.

If scabbed potatoes are used for "seed" without having been sterilised, the resulting crop will almost certainly be diseased, and in addition the fungus will pass into the soil, where it is capable of living for several years. Scabbed potatoes can be used for seed without the slightest danger of spreading the disease if they are immersed for two hours in a solution consisting of 1 pint of commercial formalin (= formaldehyde, 40 per cent.) mixed with 36 gallons of water. Afterwards the potatoes are spread out to dry, when they may be cut and planted in the usual manner. Great care must be taken after potatoes have been treated as above that they are not placed in sacks or hampers that have contained scabbed potatoes.

Land that has produced scabbed potatoes is certain to be infected with the fungus, and should not be planted with potatoes for several years afterwards; but swedes, carrots, and cabbages are also attacked by the fungus. Cereals may be sown with safety on infected land. In the case of gardens and allotments where potatoes are of necessity grown every year, the trenches in which the potatoes are planted should be sprinkled with powdered sulphur. Lime favours the development of the fungus in the soil; the same is true of stable manure, nightsoil, &c. Acid manures should be applied to land that is infected. Scabbed potato peelings should not be given to pigs unless they are boiled. Burning is the safest and in the end the most economical method of dealing with them.

WHY FARMERS SHOULD PLANT PEANUTS.

We have frequently advised the planting of this crop, which goes indifferently by the names of peanut, earthnut, and groundnut. One reason why they should be grown is, that there is an unlimited demand for oil-seeds, amongst which the peanut ranks high; in fact, so excellent is the oil extracted from these nuts that it is said to be sold as pure Lucca or salad oil made from olives. Another reason is that heavy crops can be obtained without the use of manure or irrigation on sandy soils, which will not produce any other payable crop, unless it be sisal hemp. A third inducement to planting peanuts is that very little cultivation is required, after preparation of the land and keeping the young plants clear of weeds until the vines cover the ground. As in the case of the sweet potato, the vines make excellent fodder for stock. Peanut vines, however, are first turned into hay. The nut crop ranges from 2,000 to as much as 6,000 lb. per acre. The selling price averages about £18 per ton, so that even a 2,000-lb. crop would prove infinitely more remunerative than maize, potatoes, arrowroot, or even cotton or sugar-cane. There is no fear of over-production. France alone, or rather one single seaport of France (Marseilles), imports from India and Africa nearly 200,000 tons of peanuts annually. There is also good sale in the Commonwealth for the nuts. They contain from 30 to 50 per cent. of oil, the best of which is, as we have said, used as a substitute for olive oil, and the lower grade oil is used to an enormous

extent for manufacturing soap and for lubricating machinery. The quantity of seed required per acre is considerable, amounting to 16,000 seeds. These would cost about 2d. per lb. Once the land is planted, the farmer would be able always to retain seed enough for future planting. The nuts are sown in drills, 2 feet apart, and the shelled seed is set about 1 foot apart in the drills. They should not be covered deeper than 3 inches. In from four to six months the crop is ready to be harvested. The vines will then have died off, and are cut off with a reaping hook. To unearth the nuts, a plough is run under the roots, and the nuts, still attached to the butts of the vines, are laid out on a straw platform for about a fortnight to cure. The nuts may then be stripped by hand, or more cheaply by a machine called "Crocker's Separator," which separates the nuts into three grades. The unripe nuts, being the heaviest, fall into one compartment, and the ripe and lighter nuts into another. The machine will grade from 16,000 to 20,000 nuts per day. After grading, they must be thoroughly dried, otherwise they will turn dark, and lose 50 per cent. of their value. Colour is of great importance. The hulls must be bright and clean; hence those grown on sandy soils bring a higher price than those grown on black soils. The Carolina nut is the best kind to plant, as it contains most oil, and is 25 per cent. heavier than any other sort. The North American Red contains least oil, and is only grown for eating purposes. Salt land and low-lying wet soils are not suitable for groundnuts.

NEW ZEALAND "FREEZER" LAMB-RAISING.

In answer to an inquiry from a Victorian pastoralist (the *Pastoralists' Review* says)—"What do they do with the ewe in New Zealand? Do they wean the lamb and not put the ewe on the rape at all, or do they put the ewe and the lamb on the rape, and sell the ewe as fat?"—our Christchurch correspondent writes:—"The general practice of the smaller farmers on arable land is to buy old ewes each year, with mouths just good enough to last over the lambing, take one crop of lambs from them, and fatten and sell the ewes as well as the lambs. Sometimes the ewes are put on grass separately, and sometimes the ewes and lambs are put together on the rape or soft turnips. Larger farmers, particularly those who have a quantity of 'sheep country,' generally keep a permanent ewe flock, putting the ewes which are to be kept over for another season on the poorest feed after weaning, and only fattening the annual culling of aged ewes. This year anything with a mouth at all is being kept over for breeding. Many lambs and ewes are fattened on grass alone."

MARKET GARDENING.—FERTILISERS FOR VARIOUS CROPS.

In the last number of the *Journal* we gave a list of market garden, field, and fruit crops, with the times of sowing and harvesting, and the time required for the various crops to come to maturity. We are pleased to say that we have had many evidences of appreciation of the value of that article, especially from amateur gardeners. To make the subject more complete, the following recommendations for the manuring of market garden crops will doubtless be acceptable:—

In towns and on sheep and cattle stations, stable and stockyard manures are generally available; and as these or at least stable or farmyard manure are "perfect" manures, their employment is highly to be recommended. Where, however, sawdust is the basis of the manure, it is not so valuable as where hay and straw constitute the principal material. Its value depends largely on its organic matter, which helps to retain the moisture in sandy soils, and to loosen stiff clay soils and prevent them baking.

The great and only objection to stable manure is its bulk. If it has to be carted to any distance, the expense is too great for the result achieved, as a very great quantity of practically useless material has to be transported. Much may be done by a compost heap. Amateur and, in some cases, professional gardeners carefully rake up all weeds, dead plants, and leaves, wheel them to a vacant spot on someone else's ground, and either set fire to them if they will burn or leave them to waste their—not sweetness but valuable manurial constituents in the atmosphere. It should be borne in mind that all such substances, as well as soot, old boots, feathers, rags, kitchen refuse, bones, and a host of other materials, if placed in a compost heap, will eventually decompose, and, if the mass is properly treated, will form a most valuable manure for vegetables. People complain of the cost of manure, yet they make no use of the substances which are produced in their immediate surroundings, and which, at no cost beyond a little labour, will supply a great mass of the best manure in the course of the year. Near the coast there is usually a quantity of seaweed to be gathered. This forms a very valuable ingredient of the compost heap. Now, when all these substances are placed in a heap in a suitable part of the garden, the sooner they become decomposed the better. To help this decomposition, some lime should be added. The heap should be turned over three or four times a year, so that its component parts become well amalgamated. By the end of the year the compost will be ready for use. In the case of dead animals, such as rats, cats, fowls, dogs, the entrails of animals and larger bones, these should all be gathered in a specially adapted pit and covered with quicklime. The addition of water will cause the decomposition to proceed rapidly and without any unpleasant smell. In place of quicklime, dilute muriatic (hydrochloric) acid may be used. Hair, feathers, horns, hoofs, and leather may also be quickly reduced in this manner. Bones can be reduced to powder by building up alternate layers of bones and wood ashes, which must be kept moist. The wood ashes themselves furnish excellent plant food.

Following are the recommendations printed in a leaflet (No. 106) of the Board of Agriculture of Great Britain:—

The dressing of about 12½ tons per acre, frequently mentioned in the following pages, is equivalent to 25 small cartloads of town dung (not farmyard dung) in a fresh, loose condition. The recommendations given are for heavy land or for loams of fair or medium consistency. On decidedly light and freely-draining soils, 2 cwt. of the total nitrate of soda prescribed may be replaced by about 3 cwt. rape meal, or 5 cwt. of fish guano applied before sowing or planting at the same time as the phosphates and potash salts.

CAULIFLOWERS AND BROCCOLI.

A light dressing of town dung (12½ tons per acre) may be recommended, with from 4 to 6 cwt. of superphosphate, 4 cwt. of kainit, and 4 cwt. of nitrate of soda per acre; the nitrate of soda being divided into two dressings. A good crop, however, may be grown without dung by using 6 cwt. of superphosphate, 4 cwt. of kainit, and 6 cwt. of nitrate of soda per acre; the lastnamed being divided into two or three dressings.

AUTUMN CABBAGES AND SAVOYS.

A dressing may be recommended of 12½ tons of town dung, with 6 cwt. of superphosphate per acre, 6 cwt. of nitrate of soda per acre being used as a top-dressing for autumn cabbages, or 4 cwt. for savoys; one-half of the nitrate being applied at the time of planting, and the remainder a month or two later. If dung cannot be spared, the quantity of nitrate of soda may be increased to 8 cwt. per acre for autumn cabbages, or 6 cwt. per acre for savoys.

SPRING CABBAGES.

By spring cabbages is meant the crop planted in autumn and harvested in spring. These are usually dunged, but as they are not so subject to drought as spring-planted crops, they may be planted without further dung than the

residue left in the land from that applied to the previous crop. They should, however, at the time of planting, receive a dressing of 6 cwt. of superphosphate per acre. Nitrate of soda, at the rate of not less than 4 cwt. per acre, may be applied during the spring, divided into two dressings; but the quantity of nitrate may be advantageously increased to 6 cwt., and in some seasons to 8 cwt., per acre.

BRUSSELS SPROUTS.

These, on soils of fair consistency, may be readily and economically grown without dung, provided that concentrated fertilisers are liberally used. A good dressing is 6 cwt. of superphosphate and 4 cwt. of kainit per acre, applied just before planting; from 4 to 6 cwt. of nitrate of soda being afterwards used as a top-dressing, divided into two applications a few weeks apart.

On very light sandy soils that suffer easily from drought, however, some dung should also be given.

WINTER LETTUCES.

Winter lettuces may be grown without fresh dung on ground dunged for the preceding crop. Experience indicates that if a grower has used anything like 25 tons of dung per acre for the last crop, whatever it may have been, he may safely plant winter lettuces on the same land without any further manuring. If, however, he plants winter lettuces in succession to a crop that has been only moderately dunged, he may give about 4 cwt. of superphosphate and 2 cwt. of nitrate of soda per acre—the latter, of course, being applied during the spring.

SUMMER LETTUCES.

Summer lettuces, however, should not be left without dung lest they may suffer from drought early in the season. A light dressing of dung, with about 4 to 6 cwt. of superphosphate per acre, should be applied before planting, and 2 cwt. of nitrate of soda per acre applied as a top-dressing.

Summer lettuces grown thus do not appear to need any special application of potash.

CARROTS AND PARSNIPS.

Most market gardeners probably do not dung carrots or parsnips, but grow them on land dunged for the preceding crop.

If a grower has used as much as 25 tons of dung per acre for the previous crop, it will probably pay best to plant carrots or parsnips without further manuring. But following only a moderate quantity of dung for the last crop, he should give carrots or parsnips from 4 to 6 cwt. of superphosphate and 1 cwt. of sulphate of potash per acre, followed by a top-dressing of 2 cwt. of nitrate of soda per acre after the plant is well up. In the case of carrots, a further dressing of 2 cwt. of nitrate per acre may in some seasons be given with advantage a month later.

Potash salts should on no account be omitted for either carrots or parsnips.

SUMMER SPINACH.

A light dressing ($12\frac{1}{2}$ tons per acre) of dung may be recommended on heavy or medium land, with from 4 to 6 cwt. of superphosphate and from 4 to 6 cwt. of nitrate of soda per acre—the nitrate applied in dressings of 2 cwt. per acre each.

In a good season, especially on land recently dunged for another crop, a good crop of spinach can be raised without any fresh dung if the phosphates and nitrate of soda are supplemented by 4 cwt. of kainit or 1 cwt. of potash per acre; but the combination of dung and concentrated fertilisers is probably safer.

WINTER SPINACH.

Winter spinach has been grown successfully after the removal of the summer spinach, without extra manuring, on heavy land. On light land it might be desirable to give a further top-dressing of 2 cwt. per acre of nitrate of soda—without, however, repeating the application of dung or superphosphate.

BEETROOTS.

A light dressing of dung is desirable, with from 4 to 6 cwt. of superphosphate and 4 cwt. of nitrate of soda per acre, 2 cwt. of the nitrate being applied shortly after the plant is up, and a further 2 cwt. a month or so later. If no dung is used, 4 cwt. of kainit or 1 cwt. of sulphate of potash per acre should be sown before the preparation of the seed bed, and in such case also a third top-dressing or 2 cwt. of nitrate per acre may be given. On most soils, however, the application of a moderate quantity of dung is valuable for securing a plant if the season should prove dry.

Potash appears not to be necessary when dung is used.

RHUBARB.

A light dressing of town dung is recommended ($12\frac{1}{2}$ tons per acre), and from 4 to 6 cwt. of superphosphate per acre, with 2 cwt. of nitrate of soda per acre for small varieties, or 4 cwt. for large varieties. Sulphate of potash (1 cwt. per acre) has proved useful for small varieties, and will possibly benefit the coarser varieties on some soils.

Rhubarb grown with a combination of dung and concentrated fertilisers grows more rapidly, and is more tender and less stringy than that grown with dung alone.

POTATOES.

For early potatoes, on soils so heavy as that of Hadlow, 25 tons of dung per acre have consistently proved more economical than a lighter dressing, even when the latter is liberally supplemented by concentrated fertilisers. Early potatoes are very dependent upon rain, and summer rain has on the average been scarce during the seasons of experiment.

For late potatoes the best results at Hadlow have been obtained from light dung, phosphates (say 4 to 7 cwt. of superphosphates per acre), 1 cwt. of sulphate of potash, and 4 cwt. of nitrate of soda per acre, the nitrate being applied in two dressings.

In the presence of dung potash has produced little effect on the early potatoes, but much on the late varieties.

On light soils 2 cwt. of the nitrate of soda might be replaced by 2 cwt. of sulphate of ammonia (applied before planting) for the early varieties, or by 8 cwt. of rape meal, or 5 cwt. of fish guano for the late varieties; 2 cwt. of nitrate of soda per acre being applied as a top-dressing.

SPRING OR SUMMER ONIONS.

With regard to this crop, the experience at Hadlow is too limited to yield definite recommendations, for in some years the plant failed owing to drought or wireworm. A light dressing of dung, supplemented by 4 to 6 cwt. of superphosphate, 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and 4 cwt. of nitrate of soda per acre may, however, be regarded as a safe dressing.

Potash appears to be of vital importance to onions, and should on no account be omitted.

ASPARAGUS.

Excellent results may be obtained by the use of a light annual dressing of town dung (say $12\frac{1}{2}$ tons per acre), 4 to 6 cwt. of superphosphate, 4 cwt. of kainit, and from 2 to 4 cwt. of nitrate of soda per acre. Asparagus thus grown has been found to develop more rapidly than when heavy quantities of dung are used without concentrated fertilisers, and the produce has been more tender and succulent, and of better flavour, on the "combination" plots than where dung alone was used.

DWARF FRENCH BEANS.

These may be grown with a light dressing of dung, from 4 to 6 cwt. of superphosphate, and 1 cwt. of sulphate of potash (or 4 cwt. of kainit) per acre. The use of 2 cwt. of nitrate of soda per acre has in three seasons given a very

substantial advantage, increasing the average weight of beans gathered from less than $3\frac{1}{4}$ tons per acre to over $4\frac{1}{2}$ tons—an advantage of nearly 50 per cent.

GREEN PEAS.

In the case of green peas, as far as mere weight is concerned, no substantial advantage has so far been found to arise from the use of nitrate of soda, a good crop being grown from a light dressing of dung with a dressing of phosphates and potash salts. The quality, however, of the peas has been improved by the addition of 2 cwt. of nitrate per acre, both as regards colour, texture, and taste.

GLOBE OR THISTLE-HEADED ARTICHOKES.

The results of five years' cropping on the same plantation showed that a combination of concentrated fertilisers and light dung gives much better results than heavy dung. Probably the best dressing is about $12\frac{1}{2}$ tons of town dung, 6 cwt. of superphosphate, 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and from 2 to 4 cwt. of nitrate of soda per acre. This combination gives on the average a much earlier crop of heads than where dung only is used. This is important to growers who supply the London markets, for artichokes grown in the early part of the season are more easily marketable.

JERUSALEM ARTICHOKES.

For this crop the same recommendations may be followed as have been made for winter lettuces.

CELERY.

Celery, except on soils particularly well adapted to its cultivation, cannot, probably, be grown with any great success without the use of very much larger quantities of dung than are necessary for other crops. The dung should be placed in the trenches, together with a dressing of phosphatic manure. The crop may, during its growth, be occasionally top-dressed with nitrate of soda.

The use of the concentrated fertilisers may not much increase the crop, but will tend to make the celery more crisp and tender than that grown by the use of dung alone.

STRAWBERRIES.

Although the strawberry plant contains a good deal of potash, the direct application of potash salts appears to be deleterious rather than otherwise to the yield. The best general treatment is probably a light annual dressing (about 12 tons per acre) of town dung, with from 4 to 6 cwt. of superphosphate and 2 cwt. of nitrate of soda per acre.

GOOSEBERRIES.

A light dressing of dung (about 12 tons per acre) with 6 cwt. of superphosphate, 1 cwt. of sulphate of potash, and 4 cwt. of nitrate of soda per acre has given much better results with gooseberries than heavier dressings of town dung without concentrated fertilisers.

Potash appears to be a very essential ingredient of a successful gooseberry manure. The crop of gooseberries at Hadlow, over three years, was, on the potash-dressed plots, not far short of double that on the plots which received no potash.

If nitrate of soda be used as the sole nitrogenous addition to dung, not less than 4 cwt. per acre should be applied.

NOTE AS TO SUPERPHOSPHATE.

In the foregoing notes superphosphate has been recommended throughout. This is on the assumption that the soil to be manured contains a sufficiency of lime, that is to say, sufficient carbonate of lime to cause effervescence, when a mineral acid is poured on to it. On land poor in lime the place of superphosphate should be taken by a considerably larger weight of basic slag, or

Peruvian guano, or of fine bonemeal, or of a mixture of superphosphate and bonemeal, or of that form of precipitated phosphate which is now to be obtained under the name of "basic superphosphate"; or at any rate the use of one or the other of these manures should be alternated every other year with that of superphosphate.

OTHER CONCENTRATED FERTILISERS.

If, in addition to nitrate of soda, other concentrated nitrogenous fertilisers are used, such as sulphate of ammonia, fish guano, dried blood, rape dust, &c., these should be put on earlier than the nitrate of soda; and in this case the quantity of nitrate would be decreased. It must be remembered, however, that the nitrogen in nitrate of soda is immediately available for plant use, and that the nitrogen in 1 cwt. of nitrate of soda goes farther for the immediate crop than the same quantity of nitrogen in the form of fish guano or rape dust or dried blood, or even (except in a wet season) of sulphate of ammonia. In fact, the choice between nitrate of soda and sulphate of ammonia, and their proportion to any other nitrogenous fertilisers used, is to be determined in individual cases by circumstances of soil, climate, and cost.

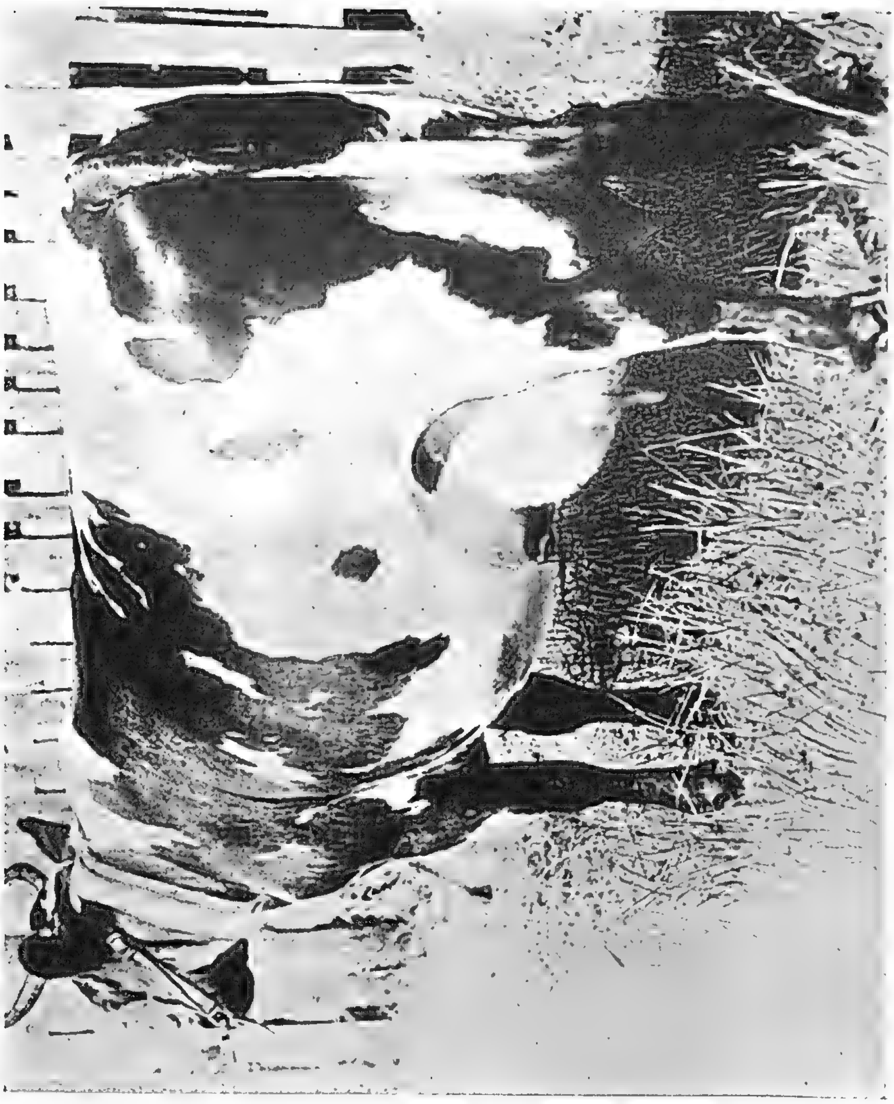
COST OF MANURING.

As a rule the concentrated fertilisers recommended in the foregoing pages will cost about £3 10s. per acre for heavy or medium land, or about £4 for light land. If town dung be taken at 7s. to 8s. per ton, the combination of 12½ tons of dung and the concentrated fertilisers will come to between £8 and £9 per acre. Sufficient town dung to give as good a yield as the mixed dressings would probably cost £15.

Many market garden crops, however, can be well grown (except on very light or dry land) with chemical fertilisers alone at at cost of £3 10s. or so per acre, following some other crop that has been already dunged.

INOCULATING THE SOIL.

An English paper, in allusion to this subject, says:—Soil inoculation is engaging some attention in the continent of America, but in this country it had practically been given up as a scientific wild-goose chase. The reason for this is partly that such experiments as have been undertaken have shown no encouraging results; and, secondly, because of the explanation given in what is called the "new soil science," which explains how the bacteriological utilisation of the food of the soil is due entirely to the fact that the soil must in the first place be rich—bacteria will not exist in a barren soil. Some particulars are given in the journal of the Board of Agriculture for February of the use of pure cultures in soil-inoculation abroad. Some years ago it will be remembered that a fanciful idea possessed the souls of one or two that the farmer of the future could go about with his manure heap in his waistcoat pocket, and that soil-inoculation might prove of infinite benefit to agriculture. It would appear that the most satisfactory results of the experiments abroad come from inoculation on soils which are almost or entirely devoid of nodule bacteria, such as newly broken-up soil, newly-cultivated moorland, or on soils which contain the bacteria, but not in a form suitable for the particular crop which it is proposed to cultivate. Those cultures are sent out in glass tubes, which should be preserved in a dark, moist room. The Board of Agriculture has obtained a supply of these soil germs, and they will be tested at various agricultural colleges and experimental farms in this country. The report of the United States Secretary of Agriculture indicates that where these organisms are used in accordance with the directions an increased yield ranging from 15 to 35 per cent. is secured. However, that belongs to the future, and we await the result of tests in this country.



Type of Australian Milch Cow.

Dairying.

THE DAIRY PRODUCE ACT OF QUEENSLAND.—INSTRUCTION TO DAIRYMEN.

(Concluded.)

AROMA IN BUTTER.

A good flavour in butter is defined as something that pleases the taste, something that leaves a pure and delicate aroma of cream in the mouth. There is nothing that you can object to—no bitterness, no acidity, no stale or aged taste. It is alone the flavour of a choice product—butter that has been manufactured from choice cream separated from pure and carefully handled milk. There is conclusive evidence, in the practice of the farm, that the finest butter can only be made from the best of milk and cream; it will be well to explain what gives to butter its good attractive aroma. It is not chiefly the food that the cow consumes, neither is it due to the breed of cattle, but it is something that has been formed in the cream as a result of the care and cleanliness that the farmer has given to the handling of his supplies before being sent to the factory. The true answer is because the milk and cream have been kept free from the attacks of particles of dirt and unpleasant smells. But why use the word "attacks" in the answer? Because the living organisms that produce the taints or bad flavours are always to be found clinging to the atoms of dust or dirt that fall into the milk or cream supply; hence the great evil of dairying is neglect to keep the produce free from the attacks of germ-infested dirt. Smells also taint the raw product, not only when the milk or cream is cold, but when it is warm and fresh. It is needful then to prevent the development of any odour about the dairy that is objectionable, and which may prove hurtful to the quality of either butter or cheese.

HOW TO KEEP BAD FLAVOURS OUT.

By putting the following rules into practice the dairying industry would be substantially benefited:—

1. Thorough cleanliness in milking.
2. Thorough cleanliness of milking-yards.
3. Thorough cleanliness of the utensils used for keeping the milk or cream in.
4. Thorough cleanliness of the room or place where the milk or cream is stored in.
5. Freedom from objectionable smells in and around the dairy.
6. Skilled treatment of milk or cream before it reaches the factory.
7. Conveyance of milk and cream to the factory in a sweet and pure condition.
8. Purity of drinking water for cows.
9. Freedom of taint-causing weeds and plants from the food of milking stock.
10. Skill in ripening cream and churning it into butter.

Consider Rule No. 1. As much taint-producing "dirt" with its living organisms clinging to it is liable to fall into milk at this very important stage of dairy work, the adoption of simple practices is commended in order to prevent the milk becoming sour or ill-flavoured. These precautionary measures are as follows:—

1. Milk after the udder and flank of the cow have been made damp with a clean cloth.
2. Milk after the teats have been washed.
3. Milk after the hands and clothes are clean.
4. Milk in a clean place and into a clean vessel.

In carrying out these recommendations, there is nothing burdensome, and the gain to the suppliers, factory, and industry will be a fitting reward. Little or no extra time would be required compared with the common and objectionable practices of to-day. A boy would precede the milkers, and do the damping of the udder and flanks and washing of teats. Such a provision would leave the milkers free to do the milking only, thus avoiding as much of the dirty work as possible. The same person would provide water for the milkers to wash their hands after finishing each cow, also a clean supply for moistening the hands during milking. The writer would suggest that those engaged in milking should provide themselves with two or three cheap suits of overalls, to be put on immediately before the operation is commenced and taken off immediately after it is over. Let the young people on the farm be taught the value of care and cleanliness in milking, and as they grow up the knowledge gained will enable them to appreciate and understand the true value of dairying education. It will be by this means that the foundation of the industry will be greatly strengthened.

Rule No. 2: Thorough Cleanliness of Milking-yards.—Some farmers wonder why so much has been said about this part of dairy instruction. It is because taints in produce have been traced to the insanitary condition of milking-yards. Some time ago my attention was drawn to a very peculiar flavour in cream and butter. Scientific examination of the affected samples was made, and I succeeded in finding that the injury to the cream was the work of a particular germ, and was not caused by the ill-health of the cows or by taint-producing weeds in the food. As the bacteriological investigation was being pursued, the factory manager made inquiries at the farm whence the cream was supplied. He was successful in arriving at the source of the trouble, which had its origin in the uncleanly condition of the ground where the milk was kept during the night. As soon as this was explained to the farmer, he recognised the error of having his milk and cream cans in such a dangerous place, and at once set to put everything in a satisfactory state. After this was done, no further trouble has been experienced. Other ilustrations of a similar kind could be given; but the above is sufficient to fully convince readers of the dangers that result from want of simple precautionary measures on the farm.

To reduce the risks of milk contamination and make the milking-yards pleasing to the eye, have the milking-bails kept white with limewash; and twice daily have the droppings from the cows removed to the manure or refuse heap.

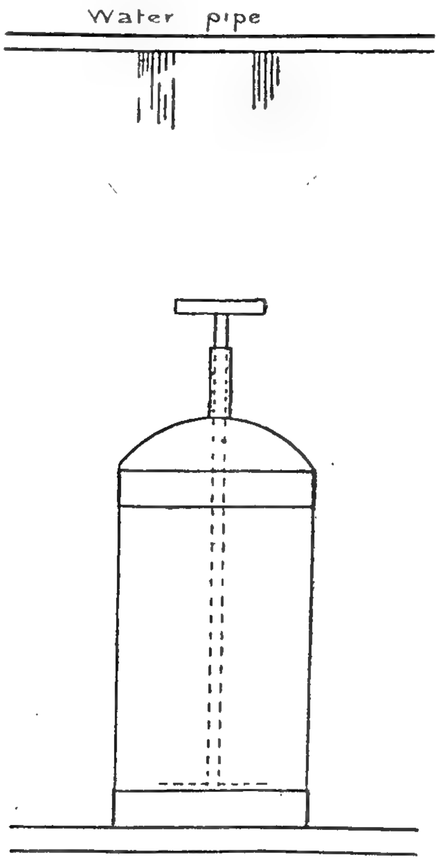
Rule No. 3: Thorough cleanliness of the utensils is another important matter which deserves great care on the part of those who are trusted with the work. When sufficient washing has not been given to cans, fermentation or decay quickly follows in the vessels; and when a supply of fresh milk or cream is added it is at once attacked by hurtful germs, and immediately begins to turn sour and tainted. In sterilising dairy appliances you cannot be too particular in the free use of boiling water and soda, in the proportion of ½-lb. soda to 10 gallons of boiling water. This should be used after washing the vessels with cold water. The solution not only destroys all living germs with which it comes in contact, but it keeps the utensils from rusting. Also, it is pointed out that extra care is required in thoroughly cleansing the seams of milk and cream cans.

Rule No. 4: Thorough Cleanliness of the Room or Place where Milk or Cream is stored in.—It is absolutely necessary that storage-rooms be used for no other purpose than to keep milk and cream in. If this be disregarded, and dairy produce stored along with vegetables, meat, harness, clothing, &c., odours will taint the atmosphere and injure the perishable produce. To prevent damage of this kind, whitewash the walls of the room with hot lime at least every four months, and make sure that sufficient ventilation is provided. Put wire gauze over the windows, and a gauze inside door will be found very profitable for admitting a free circulation of air, and preventing the entrance of flies and other insects.

Rule No. 5: Thorough Freedom from Objectionable Smells in and around the Dairy.—Bad smells in the air surrounding milk or cream is most injurious, owing to the rapid absorbing power of the raw produce. This can be proved by placing a vessel of milk or cream in a room in which the odour of turpentine, kerosene, onions, or any strong-smelling substance is detected. In the course of a few hours the produce will taste of the impurities in the air.

Rule No. 6: Skilled Treatment of Milk or Cream before it reaches the Factory.—In the milking of cows and in cleanliness of milk yards there may, in some cases, be little to find fault with, yet the milk and cream become speedily sour and tainted through being kept in closed cans and shut up in a warm room, or left uncovered in a dusty place outside. It is strongly recommended to put freshly separated cream in the coolest place in the dairy and not expose it to high temperatures. Sinking a well for the special purpose of cooling cream would repay the labour incurred. Let the following method, which has already proved profitable, be tried wherever a supply of water is procurable:—

Overhead erect a watertank, attached to which is an iron pipe—preferably gun metal—perforated with small holes situated at short distances from each other. Underneath is a plain wooden stand, on which the cans are placed.



The cans are of the ordinary shape, and have a specially constructed lid with a tube on the top 8 inches long, through which passes the handle of the stirrer. On the cans there are stout covers, made so as to be easily removed. From the top the drops of water are regulated so as to keep the cans continually moist. The accompanying diagram illustrates the process of cooling.

To prove the efficiency of the cooler, the following test was conducted by a dairyman in South Australia, who has been most successful in the application of the system:—

TEMPERATURES OF CREAM AND SKIM MILK.

Temperature of Air in the Shade, 95 degrees Fahr.

Cream.	Before Cooling. 11 a.m.	2 p.m.	5 p.m.	After Cooling. 8 p.m.	6 a.m. Next morn.
	Degrees.	Degrees.	Degrees.	Degrees.	Degrees.
No. 1 can, full	82	74	68	67	61
No. 2 can, full	82	75	66	66	60
No. 3 can, full	80	74	67	66	60
No. 4 can, half full ...	84	75	68	66	59
Skim milk, full	84	76	70	69	...
Water use	70	72	78	78	68

By the foregoing results it will be found that the average fall in temperature of the five cans during the first three hours was 10 degrees, the second 7 degrees, the third 1 degree, and from 8 p.m. to 6 a.m. 6 degrees, making in all 24 degrees. The enterprising farmer informed me that had the day been warmer than 95 degrees the temperature of the cream would have been lower; but on no occasion was he compelled to churn the ripe cream at a higher temperature than 58 degrees Fahr. Milk and cream suppliers will find the cost of erection of this cooler very little, all that is necessary in the shape of a building being low walls of skeleton woodwork covered with canvas. A feature of the system is its adaptability to the treatment of small supplies, as well as of a large number of cans. When the above system of cooling cannot be adopted in the preservation of milk, let the aerators now on sale be put into practice. A novel method of cooling dairy produce is to be seen on a Queensland farm. A simple device consisting of a circular stand of shelves is erected in the dairy, over which is a canvas cover, the top part being submerged in a receptacle of limewater. By this mean a constant circulation and evaporation of water goes on day and night. The higher the temperature the more moisture is given off, which correspondingly extracts the heat from inside the stand, thereby cooling the stored produce and retarding fermentation.

Rule No. 7: Conveyance of Milk and Cream to the Factory in a Sweet and Pure Condition.—Having adopted the recommendations in Rule 6, it will be a less difficult matter to provide the factory with sound supplies. With the already covered milk and cream cans well saturated with water, let them be forwarded in that condition, and, no matter how warm the weather may be, a quick rise in the temperature and acidity of the cream will be prevented. If covers have not been employed as suggested in Rule 6, have them made purposely for use in the cartage of milk and cream, and by keeping them well drenched with water there will be a gain in the sweetness of the supplies. I would strongly urge suppliers to send the milk and cream to their respective factories in filled cans, which will prevent the evils arising from jolting; but would point out that this must be done only when the supplies are in a fresh condition. Milk that has become slightly acid should be sent unmixed with fresh sweet milk, and, wherever possible, keep the morning and afternoon supplies in separate vessels. In the case of cream, do not, under any consideration, mix quantities that have become advanced in acidity with a fresh sweet product. Send your consignments of cream to the factory of your district as frequently as you can.

Rule No. 8: Purity of Drinking Water for Cows.—The freedom from impurities in drinking water is favourable to the production of sound-keeping milk; but, on the other hand, when animals receive quantities of tainted water, the milk suffers in consequence, and does not possess the same good properties. To avoid this danger, it is wise to provide a clean and pure supply, and to have the drinking trough situated at a convenient distance to where the cows are grazing. If this is not done, the cows will deny themselves their requirements of water when they are most in need, and this serious want will injure their milking qualities and encourage disease.

Rule No. 9: Freedom from Taint-causing Weeds and Plants from the Food of Milking Stock.—In many districts close attention is required to reduce the overwhelming growth of destructive weeds, and, if possible, eradicate them from the land. The distribution of these unwelcome plants extends over a large area of country, and the bad influence is felt by stockowners as well as dairy farmers. In some parts of the State the wild mustard, cress, and turnip flourish, and in certain months of our export trade the injury to the flavour of butter is considerable. A strong effort should be made to effect a clearance of these troublesome plants, selecting the smallest paddock on the dairy farm to commence operations. Where there is a good natural pasture, a destruction of the flowering heads and stems should be made, thereby preventing the spread of matured seeds which, if left undisturbed, would give rise to fresh plants on other parts of the farm. In cultivated crops such as lucerne, rape, and cabbage, trouble frequently arises, but there is no reason why the milk should be tainted when ordinary precautions are taken. To prevent the occurrence of taint, lucerne and rape should be given to cows in small quantities, and when fed immediately after cutting it is recommended to mix the lucerne with dry fodder. In feeding cabbages, I would draw the attention of the suppliers to the possibilities of a bad flavour in the milk arising from the use of the stems; and, to avoid risk, I would suggest giving this food, as well as others of a taint-producing character already mentioned, to the cows after milking. The farmer's discretion is also required in the feeding of silage, the milk supply having suffered in some dairies from want of care in the manner indicated.

Rule No. 10: Skill in Ripening Cream and Churning it into Butter.—It is not desirable to elaborate on the ripening of cream and the making of butter, as factory suppliers are not expected to pursue this branch of dairying. Notwithstanding this fact, much "cream-ripening" is done on the farm to the serious detriment of the manufactured article, and to the injury of the dairyman, the factory, and the State. The reputation of butter-makers is dependent upon the flavour of the produce, and this important quality in butter follows the care and skill that have been devoted to the ripening of the cream. Such a responsible duty should be entrusted to our painstaking and trustworthy factory managers only, who alone have the necessary equipment to control acid fermentation, and who understand when to churn cream to obtain the best results in both quantity and quality of butter.

In dealing with the most vital part in our paper, all will agree that much is to be learned by suppliers in the way of collecting cream. The customary practice, and one that is attended with evil consequences, is to run cream from the separator into the same vessel twice daily until a sufficient quantity is obtained for conveyance to the factory. Another mistake is keeping cream consignments too long on the farm, and it is a general practice that morning and afternoon collections are made in the same vessel, leaving layers of old and fresh cream in different stages of fermentation. It would be to the monetary gain of the supplier to employ more vessels for this purpose, keeping them in a cool place, and by thoroughly mixing the collections after the warm cream was cooled. In this way acidity would be better controlled and more evenly distributed, and a finer flavour and better-keeping butter produced. More frequent attendance of suppliers is also urgently wanted at the factories. If this were carried out, the quality of cream would certainly reach a higher standard of excellence.

Another matter to be deprecated is the system of running off cream of a thin consistency. Supplies containing less than 40 per cent. of fat increase the difficulties of the manufacturer in turning out a first-class article, as thin cream has a poor keeping quality. The main objection raised by suppliers to separating cream with a high percentage of butter-fat is unsatisfactory. In many of the leading factories an allowance in favour of the supplier is made. A cream testing 40 per cent. from a measured sample would make half its weight of manufactured butter—*i.e.*, 2 lb. of cream to 1 lb. of butter. It is, therefore, strongly recommended that suppliers make the standard of their cream not lower than the percentage mentioned.

Important Factors in the Separation of Milk.

The following may be taken as a guide for farmers in the manipulation of the separator:—

Separate the milk as it comes from the cow.

When this is inconvenient in cool weather, heat up to 90 degrees Fahr. immediately before separating.

Do not separate colostrum or beastings, neither the milk from diseased animals nor when calving is near.

Do not mix cold and hot milk together, nor acid and sweet supplies.

Milk that is a few hours old in summer weather should be separated alone and unheated.

Have your separator firmly fixed, and all parts in thorough working order.

Run a little warm water throughout the machine before commencing to separate.

Regulate the inflow of milk.

Keep the receiver well filled throughout the whole period of working.

Do not alter the cream-screw, unless it is absolutely necessary; skim an equal percentage of fat daily.

Take the machine to pieces and thoroughly clean the inside parts when finished separating, and expose fully to the air.

Put the separator together immediately before use.

Be very careful to work at a sharp and steady speed.

Do not add preservatives to milk to keep it sweet for separating.

Do not skim your cream at less than 40 test. Cream of low density entails extra cartage and railage, risks of souring and churning are increased, and, worst of all, an inferior quality of butter is produced.

Thoroughly wash all cans as soon as returned from the factory or depôt. Stand them on rack (without lid) till ready to receive cream again.

Put a wet bag over each can while in transit.

Rule No. 11: The Use of Preservatives.—The use of powders and liquids sold for preserving dairy produce has become very common. Of the compounds in the market some have marked preservative properties, and are safe only when employed in factories; but it is well established that preservatives are added to milk and cream by the dairy farmers. Suppliers are not aware of the injurious effects these so-called "harmless" salts and liquids exert on the value of milk for butter and cheese making; and, in the case of preserved cream, the butter manufactured never possesses the characteristics of the article made from a well-ripened product. If suppliers carry out the recommendations given in this article, there will be no need for incurring the expense of preservatives, and the quality of the produce will be further improved. It should be borne in mind that the Dairy Produce Act prohibits the use of preservatives by milk-suppliers.

Aeration and Cooling of Milk.

This is a most interesting and vitally important question to the factory manager, and one which has been discussed very much of late. Little has been published to illustrate the efficiency of any particular method of cooling the raw produce of the dairy farm.

Aeration has been talked of in Queensland, and the introduction of suitable appliances has been strongly recommended by scientific authorities, as the benefits arising from its use are unquestionably great, not only to the factory supplier, but to the industry generally.

To the ordinary observer, Denmark's precautionary measures in cooling milk on the farm seem unnecessary where the climate is averse to the speedy propagation of germ life and the development of acids and taints in dairy produce. But the Dane has found it beneficial in the manufacture of butter and cheese to prosecute the system of cooling with increasing energy. Now the question as it concerns Queensland stands thus:—If countries with a comparatively cold climate find it imperative to enforce the aeration of milk, why

should we, in a sub-tropical climate, not do something on similar lines? It would minimise the heavy losses which inevitably must follow the neglect of so important an operation; and thereby increase the value of the dairy produce. Ice and cold water, although not always easily obtained in summer, is not sufficient to excuse dairymen from the charges made against them for lack of enterprise. By not using some simple and inexpensive appliance to militate against the ravages of fermentation, and to expel from milk and cream repugnant flavours peculiar to plant life, exposes dairy produce to serious danger from taints. The adoption of aeration and coolers would amply repay for their purchase, and the time and trouble necessitated in working the appliance would not be considered an objection by the progressive and intelligent dairyman. The protection of vessels containing milk and cream from the destructive influence of direct sunlight and a sweltering atmosphere is another question for the serious consideration of all persons interested in the success of Queensland dairying.

AERATION OF MILK.

In order to demonstrate to milk-suppliers the beneficial effects of the aeration of milk directly after milking, I had a number of practical experiments conducted with that end in view. A progressive step in the practice of keeping milk which will increase the quantity and improve the quality of a whole factory's supply of milk cannot but commend itself to the favourable consideration of suppliers and factory proprietors. It is within the mark to say that, by a thorough system of aeration and cooling by suppliers, the milk would be enhanced in quality by nearly 50 per cent. and the supply of a season increased by several thousands of gallons. In almost every dairying district thousands of gallons of Saturday night's and Sunday's milk are fed to pigs or made into butter and sold for actually half the money that would be received were it kept sweet and delivered to the local factory. As a result of aeration cooling and rigorous cleanliness of milk utensils, comparative figures show that 5,000 odd gallons of Saturday night's and Sunday's milk were delivered to a factory from 1st September to 31st September—milk which otherwise would have been fed to pigs or calves or converted into inferior butter. Previously no milk more than twelve hours old was received for cheese-making at the factory referred to, except during the three winter months, while on several occasions Saturday evening's aerated milk was received on Monday morning containing a sufficiently low percentage of acid to pass for cheese-making. On all occasions cheese made from such milk was first class.

The following tables will show the good effects of aeration and cooling:—

Date and Hour.	Aerated Milk. Temperature before Aeration. Degrees.	Aerated Milk. Temperature after Aeration. Degrees.	Unaerated Milk. Temperature. Degrees.
Nov., 6.30 p.m. ...	... 88	... 83	... 86

At 6.30 on the following morning the aerated milk was found to be infinitely superior in taste, being free of odours. The unaerated milk possessed a distinct "cowy" odour and a flavour of dandelion.

Three cans of milk were treated in this test on 4th December, 1900.

Four equal quantities were treated immediately after milking, and tested twelve hours later on the following morning.

	Temperature before Aeration. Degrees.	Temperature after Aeration. Degrees.	Condition.	Time Coagulating. Hours.
1 can aerated and cooled	94	74	Sweet, good flavour	40
1 can cooled only ...	93	74	Sweet, weedy flavour	37
1 can as milked ...	93	...	Rank smell ...	28
1 can aerated only ...	94	89	Sweet flavour ...	38½

Several other experiments carried out all showed in a marked degree the effect of aeration in driving off odours of all kinds common to milk.

COOLING CREAM.

Equally successful experiments have been made in the treatment of cream, as in the case of milk. For the cream vessels, thick covers would be better adapted, as the absorption water power is greater, and the cooling properties better illustrated. The method of cooling cream is similar to that for cooling milk, referred to in another part of this paper.

TEMPERATURE OF CREAM AND SKIM MILK.

Temperature of Air in the Shade, 95 degrees Fahr.

Cream.	Before Cooling. 11 a.m. Degrees.	Before Cooling. 2 p.m. Degrees.	After Cooling. 5 p.m. Degrees.	After Cooling. 8 p.m. Degrees.	After Cooling. 6 a.m. next morning. Degrees.
No. 1 can, full ...	82	74	68	67	61
No. 2 can, full ...	82	75	66	66	60
No. 3 can, full ...	80	74	67	66	60
No. 4 can, half full ...	84	75	68	66	59
Skim milk, full ...	84	76	70	69	...
Water used ...	70	72	78	78	68

By the foregoing results it will be found that the average fall in temperature of the five cans, during the first three hours, was 10 degrees, the second, 7 degrees; the third, 1 degree, and from 8 p.m. to 6 a.m., 6 degrees, making in all 24 degrees.

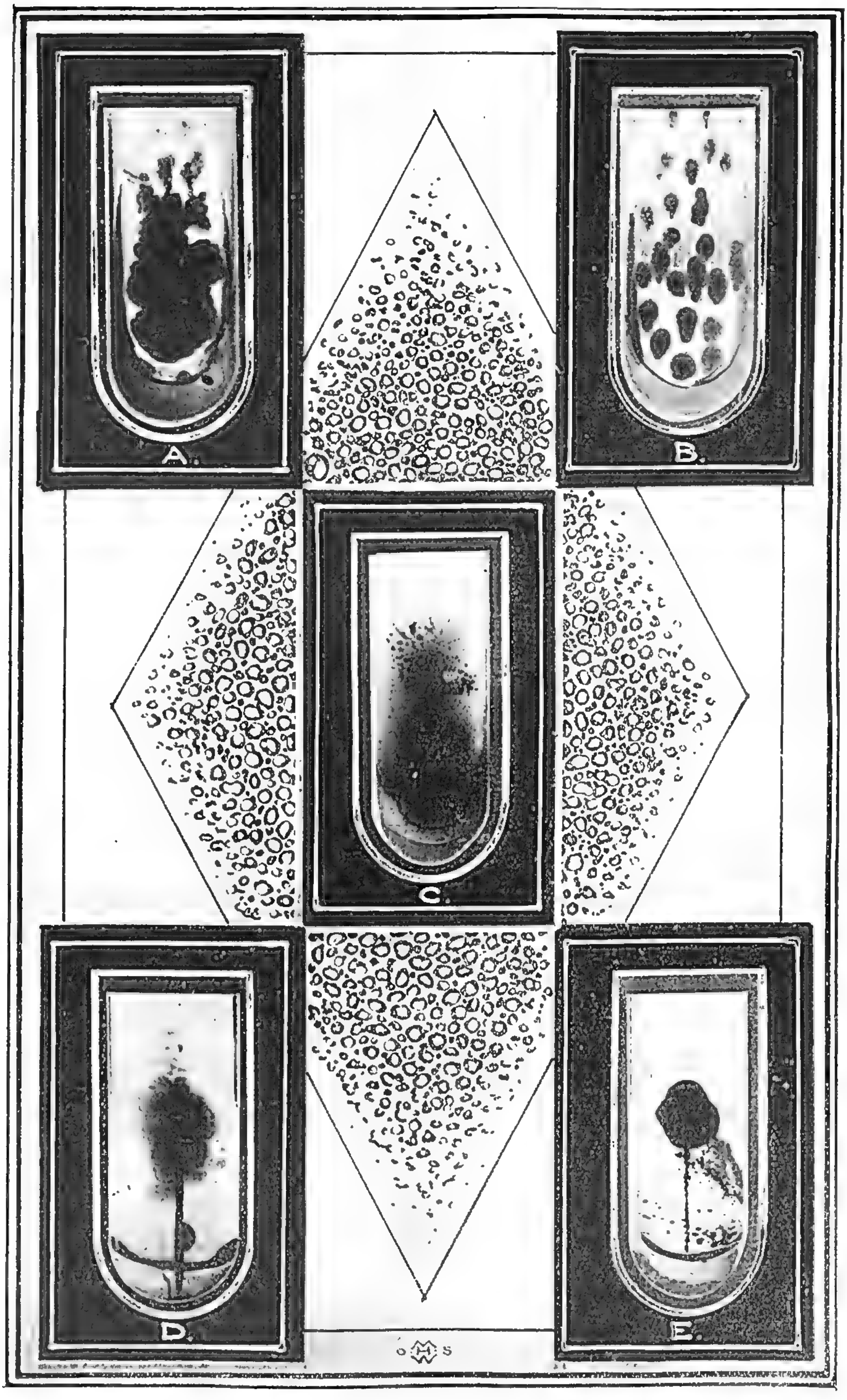
As already pointed out, it is to be deplored that the unnecessary exposure of cans of cream to the burning heat and sultry atmosphere of the summer months goes on uninterruptedly, and thousands of gallons of otherwise good cream suffer from the injurious influences of bacterial life. It does not appear to be thoroughly grasped that, when cream has reached the proper degree of acidity for churning, one hour's extra keeping at a high temperature is sufficient to practically ruin the whole supply, and this is more closely illustrated in its disastrous form when the cream is not of the highest state of purity or freedom from hurtful agencies as taint-producing organisms. A knowledge of the subject of fermentation would give an insight into many so-called mysterious changes in dairy produce, and save heavy monetary loss to the State.

COOLING DAIRY BUILDINGS.

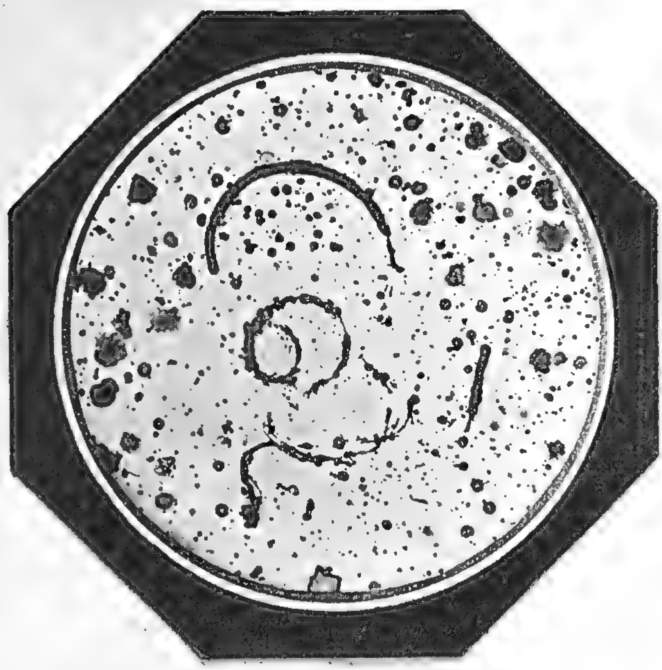
Artificial cooling of milk, cream, butter, and cheese rooms is absolutely essential to the successful manufacture of factory produce.

Three or four feet from the walls of the factory erect a cheap lattice frame, extending to the height of and joining the roof. Creeping plants of robust constitution, having large green leaves, might be planted, and the dense foliage as it covers the lattice or trellis work acts as a splendid protection against the sun's rays and heated atmosphere. The space between the thin dense hedge and the wooden walls of the factory is kept cool, which corresponds with the air-space of the refrigerated chamber.

If cream-rooms on the dairy farms were partly underground and the walls protected with plant growth as recommended, a much lower temperature would be maintained. In many cases it would be still more effective to cover the whole building with the creeper, thus shading the roof as well as the walls. The erection of rough but strongly built shelter sheds and huts grown over with creepers in districts where cream is collected by carts sent round by the factories would be attended with some success. The prevailing custom is to leave cream supplies at the roadside exposed to the weather, and when the wagon arrives further exposure is given, as no awning or covering is, as a rule, provided in the construction of the conveyance.



A and B. Cultures from dirt off milker's hand.
C. Culture of mouldy cream.
D. Stab culture, showing mould in butter made from cream C.
E. Stab culture from pastry butter.



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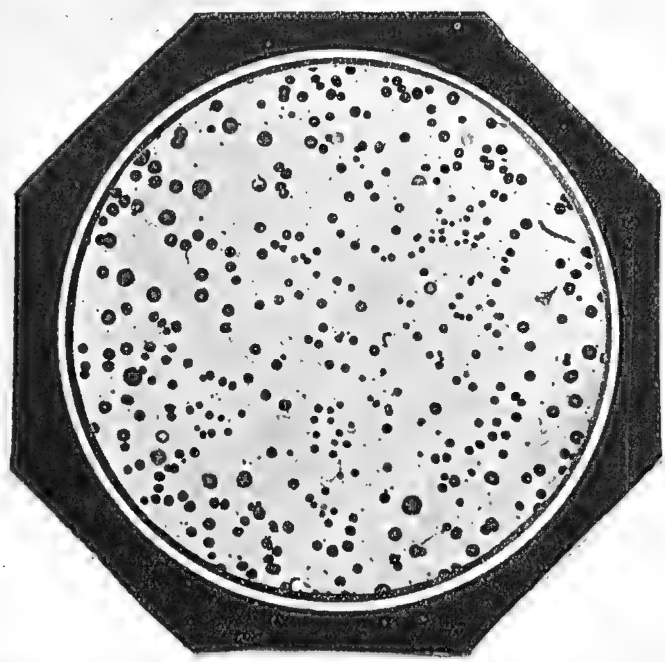
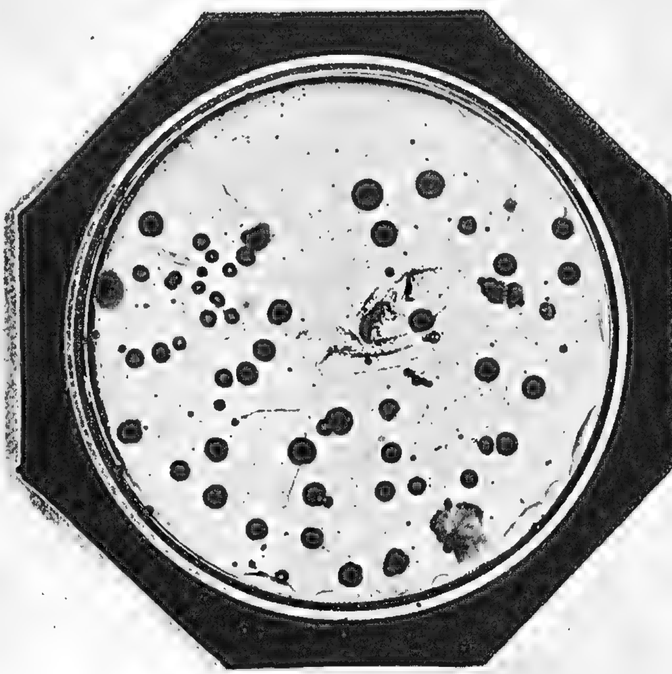


2

No. 1.—Dirty udder, showing germ growths around hairs; larger colonies are from scales and particles of dust. Exposure of plate, 40 seconds.

No. 2.—Colonies from the same udder after exposure of a second plate for 60 seconds.

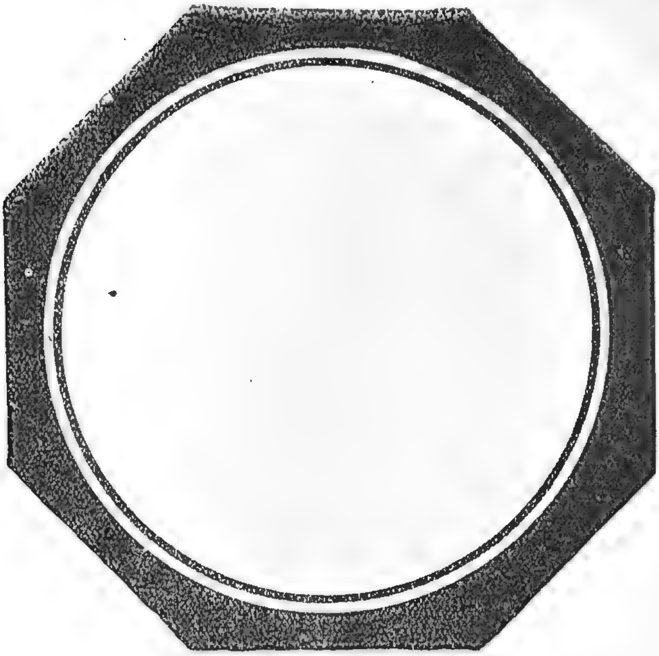
3



4

No. 3.—Freshly drawn milk contaminated during milking. Colonies of bacteria are from one drop of milk.

No. 4.—Milk-strippings contaminated during milking. (One drop.)



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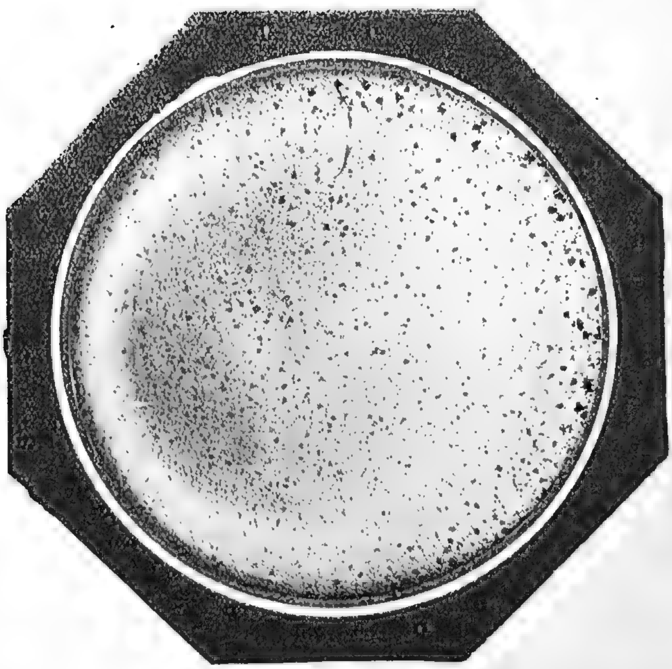
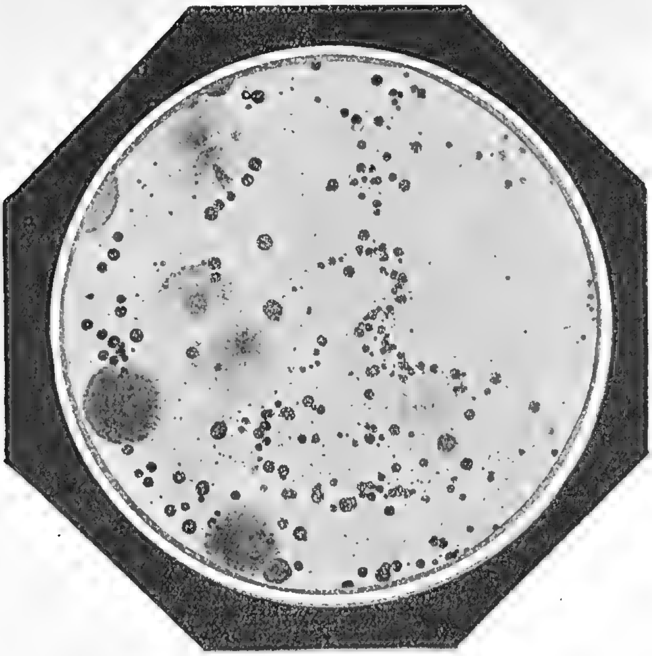


6

No. 5.—Sterilised milk free from colonies.

No. 6.—Acid milk showing colonies of the lactic-acid group of germs; no injurious organisms. (One drop.)



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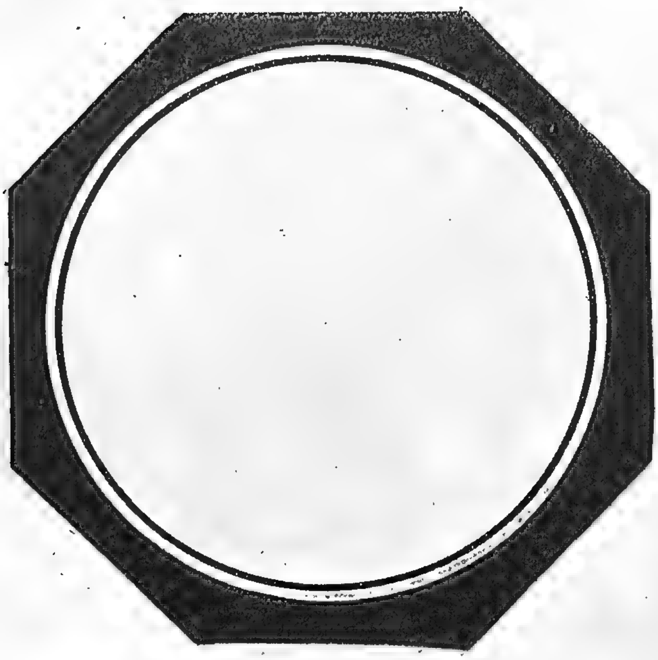
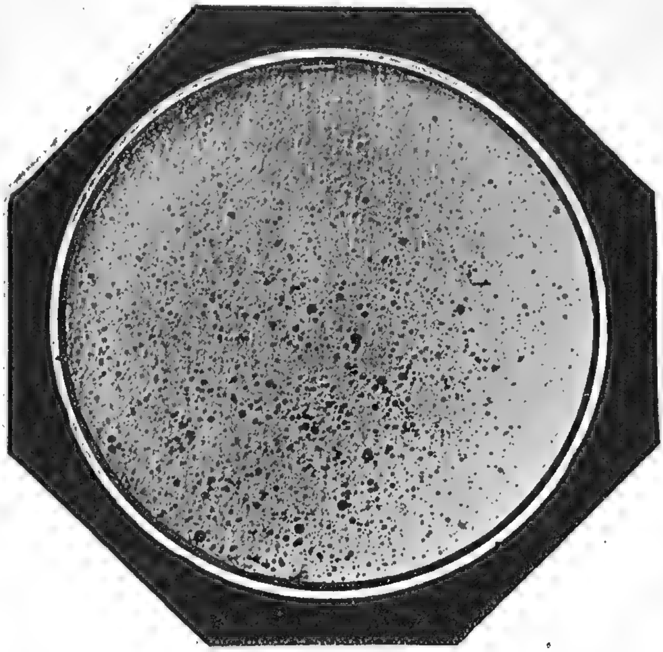


8

No. 7.—Tainted factory milk. Colonies of bacteria and mould, *Oïdium lactis*. (One drop.)
No. 8.—Sterilised cream free from colonies. (One drop.)



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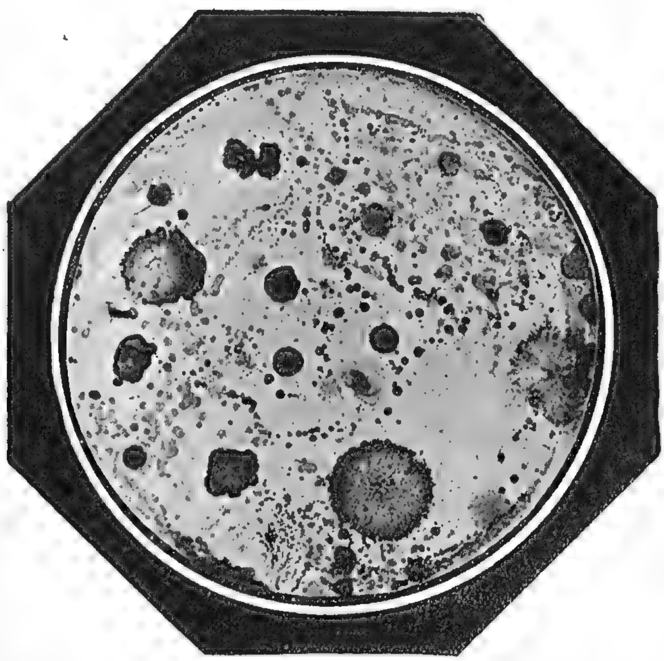
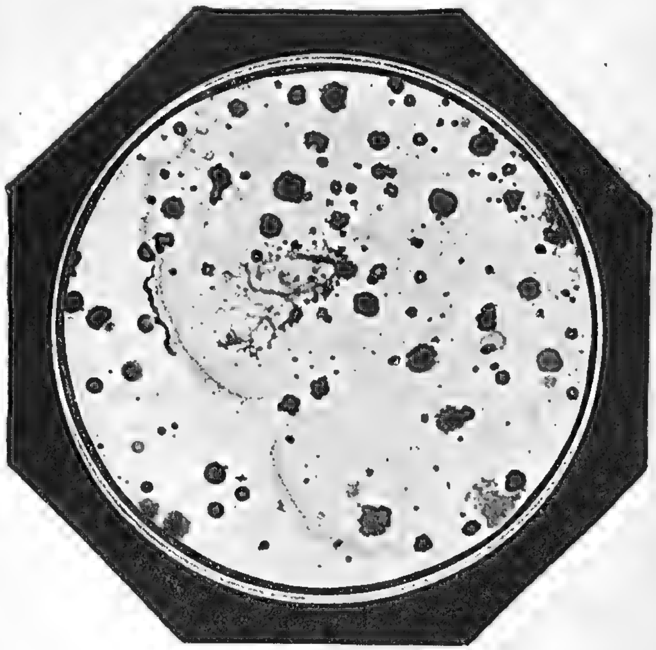


10

No. 9.—Acid cream for churning, showing "lactic acid" colonies only. (One drop.)
No. 10.—Tainted hand-separator cream. Plate shows numerous colonies of injurious organism, also moulds. (One drop.)



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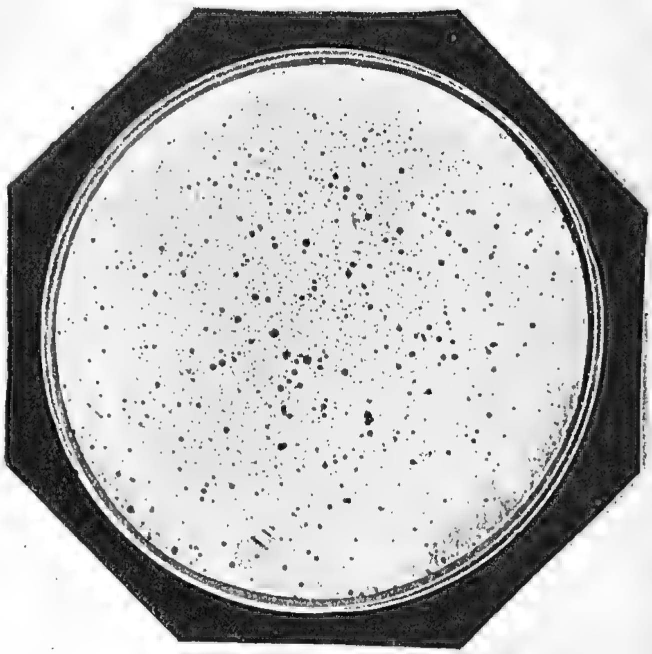
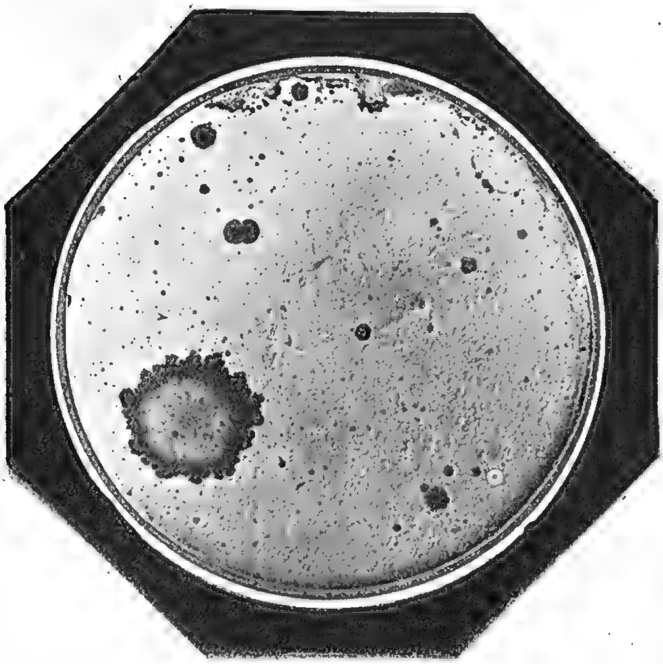


12

No. 11.—From contaminated air in milk and cream room. Colonies represent hurtful bacteria; also, different colours—viz., red, violet, yellow, and white. Moulds are also present. Exposure of plate, 10 minutes.

No. 12.—Good butter. All are colonies of lactic organisms. (One drop.)



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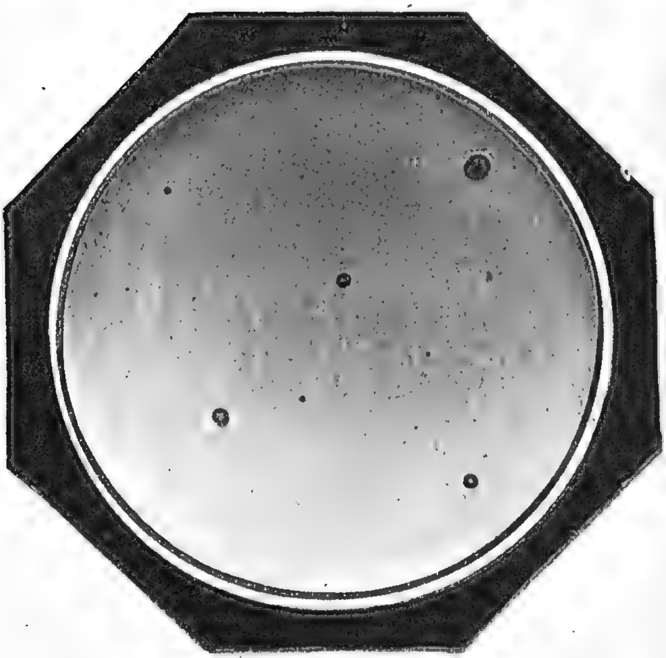
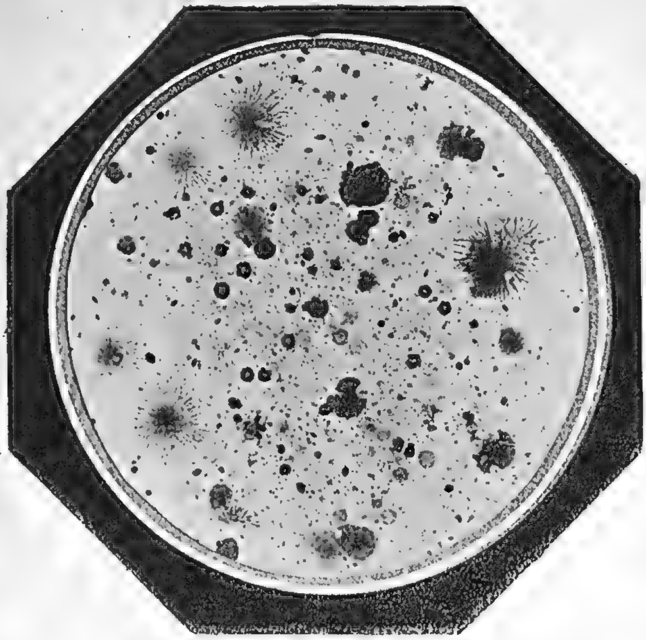


14

No. 13.—Tainted butter from No. 10 cream; colonies of taint-producing germs. (One drop.)

No. 14.—Good factory water. Natural colonies. (One drop.)

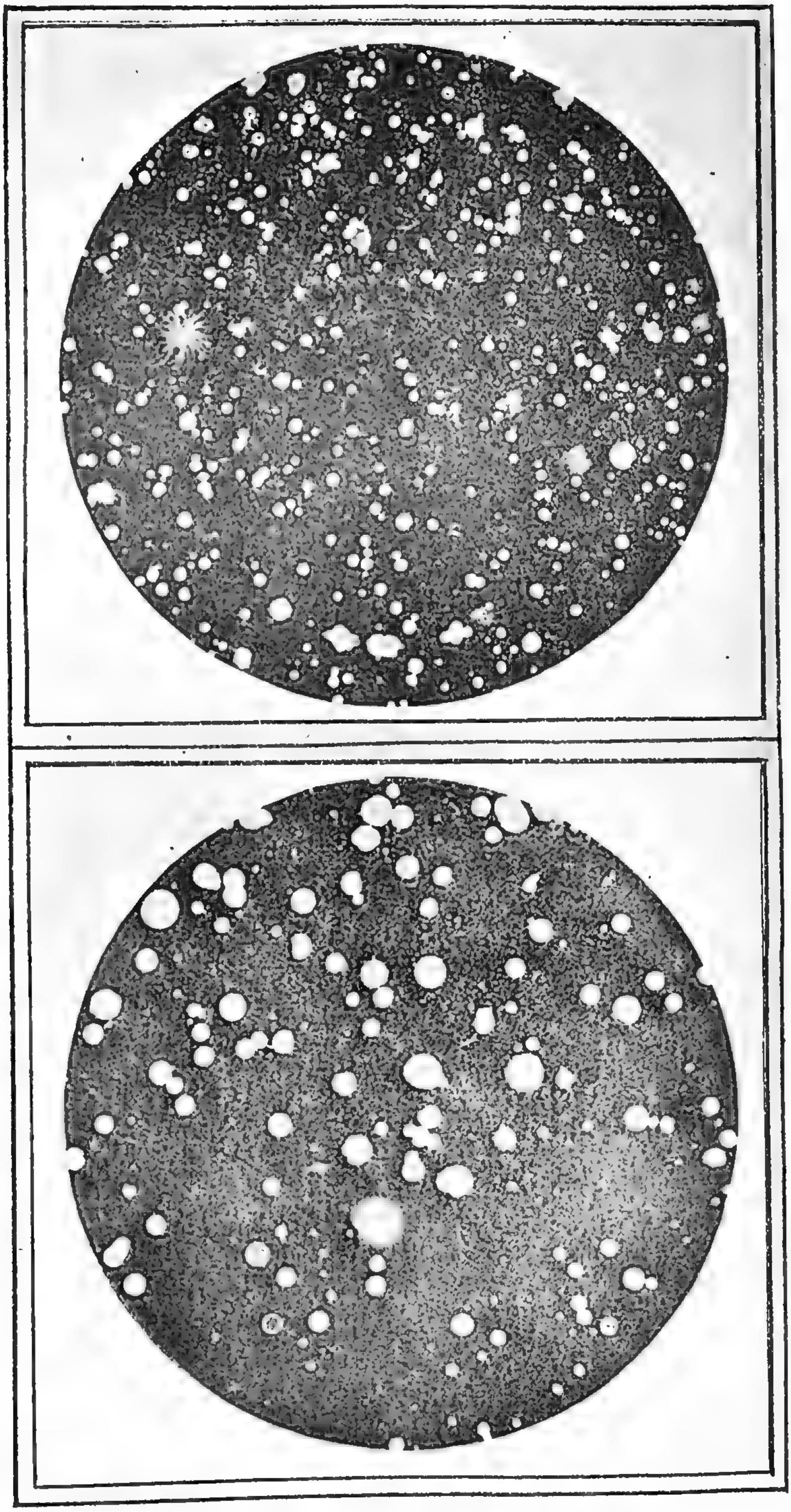


15

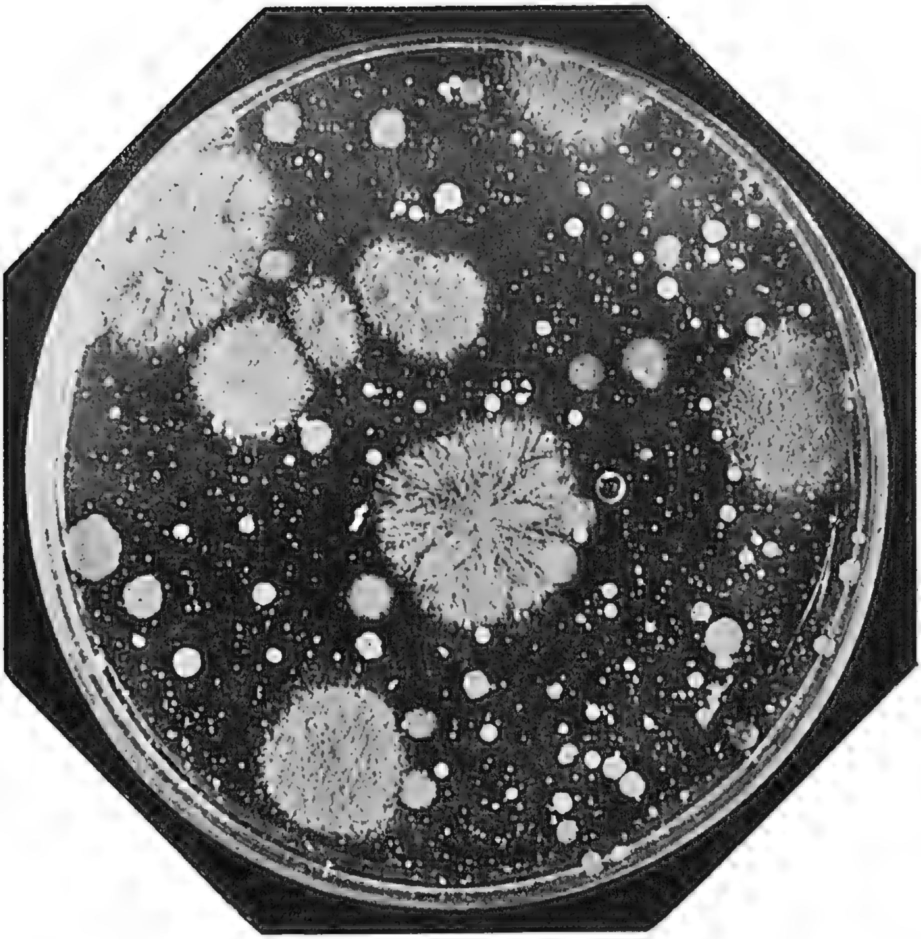
16

No. 15.—Impure factory water used for washing butter contaminated with sewage germs and moulds. (One drop.)

No. 16.—Milk from cow with disease of the milk glands.

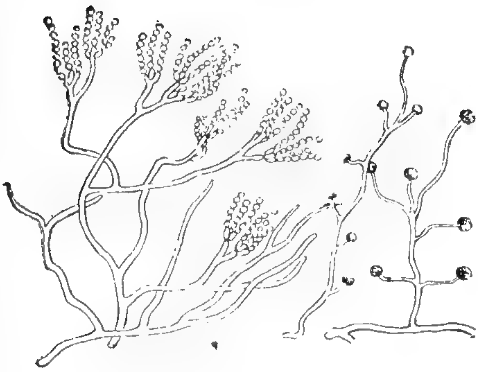


Colonies of bacteria growing in plates which were exposed to the air of a milk shop and milk cooling-room opening into cowhouse. Exposure of plates, one half-hour.

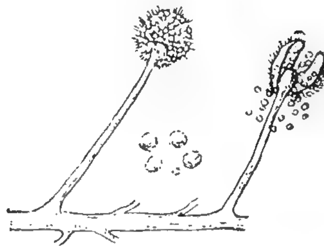


No. 17.—Cultivation of moulds and bacteria from the heart of a Cheddar cheese. (G. S. Thomson.)

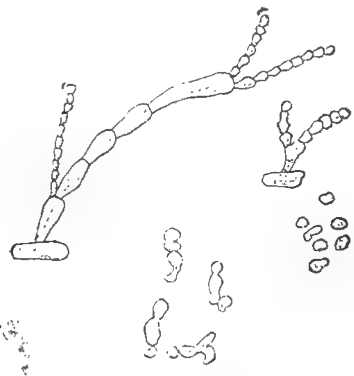
Where care is not observed in the cleanliness of rooms used for the storage of dairy produce, the seeds of injurious moulds, which are abundant, get into the milk supply and cause damage to Cheddar cheese. (Note the seeds in the next plate.)



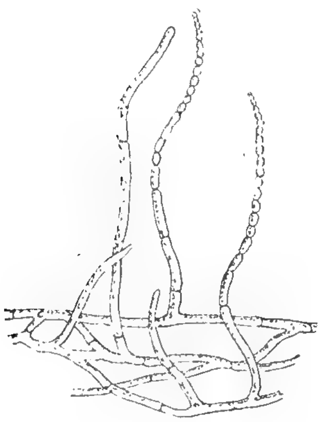
Gammelost cheese ripening moulds.



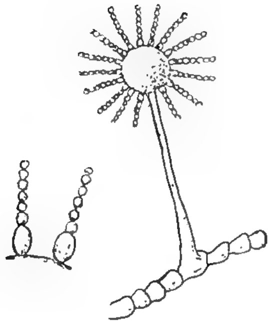
Mucor mucedo.



Oidium lactis (magnified)



Oidium lactis



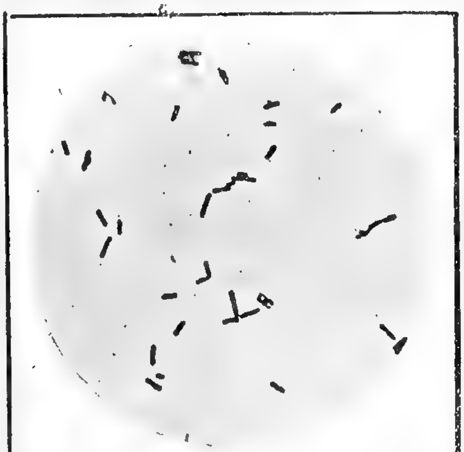
Aspergillus.

Pencillium glaucum.

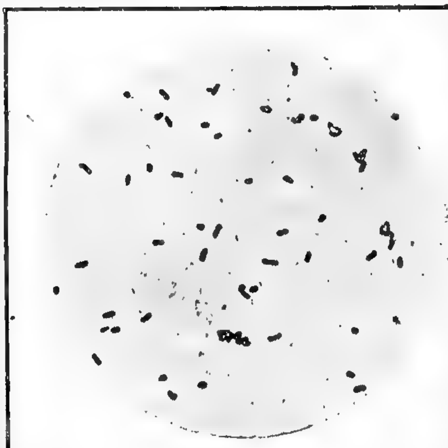
Useful and injurious moulds found in the Dairy.

Aroma bacterium (Weigmann). Agar culture; 2 days' growth at 37° C. Stained carbol-fuchsin dil. × 1000.

B. butyricus (Hueppe). Agar culture; 2 days' growth at 37° C. Stained carbol-fuchsin dil. × 1000.



B. cyanogenes (Flügge). Agar culture; 2 days' growth at 37° C. Stained carbol-fuchsin dil. × 1000.

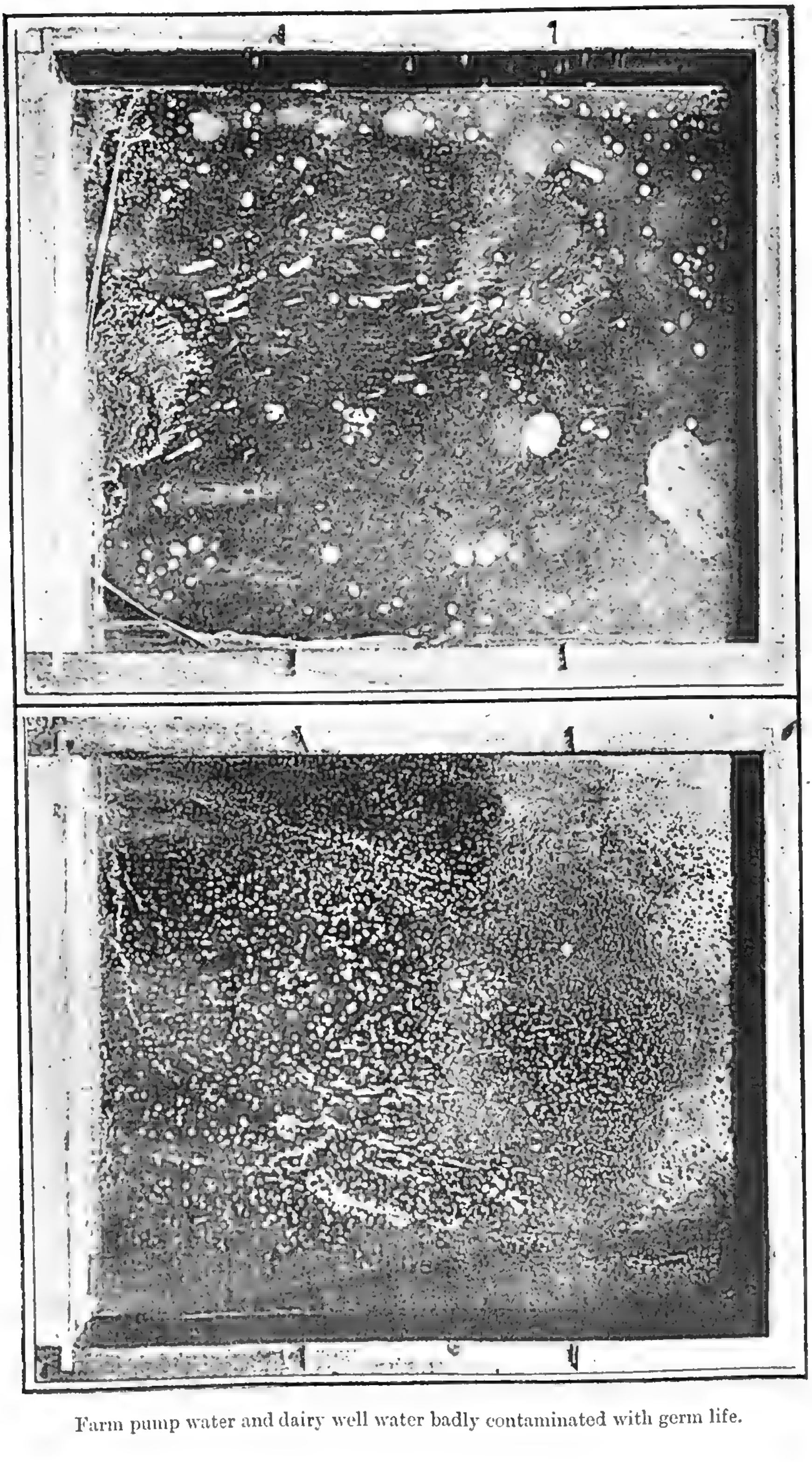


B. erythrogenes (Grotenfeld). Agar culture; 2 days' growth at 37° C. Stained carbol-fuchsin dil. × 1000.

GOOD AND BAD BACTERIA.

B. butyricus is an organism productive of a rancid flavour in cheese and butter.

B. cyanogenes causes a blue colour in milk.



Farm pump water and dairy well water badly contaminated with germ life.

Copies of "*The Dairy Produce Act of* 1904" can be obtained from the Government Printer, William street, Brisbane, on the payment of 6d. per copy; postage of 1d. per copy to be added.

All the illustrations in this pamphlet were reproduced from the original copies by Mr. H. W. Mobsby, Artist and Photographer of this Department.

BACTERIOLOGICAL ILLUSTRATIONS.

The following fifteen plates are explained in the letter-press; the remaining ones are from Swithinbank and Newman's work on the "Bacteriology of Milk."

CURING HAMS AND BACON.

Amongst the farm products of the old country on which the farmer and his wife pride themselves, are the grand flitches of bacon and the well-cured hams which grace the beams of the kitchen or store-room. What bacon, what ham, was ever so good and tasty as that cured properly on the farm? We are now close upon the time when the cold weather will enable the farmer to renew his year's supply of these delicacies. There is little need to instruct well-informed farmers of old standing how to produce a really good article, but every day new men appear on the land—not only farmers' sons, but city men—who have very little knowledge of farming or pig-raising or dairying, but who are intelligent and willing to carry out any useful suggestions which may, by their adoption, add to their comfort or to their bank account. To these we offer the following remarks on bacon-curing:—

Do not attempt to make bacon or cure hams at any time between September and May. They may say the factories do it successfully. So they do, but the farmer has not all the expensive appliances of the factory. All his appliances consist of a salting table and a couple of curing tubs, and these, although all-sufficient for the winter months, are of little value in the summer. Now, the first thing to bear in mind is, that the farm pig must be killed at the proper season of the year. On the cool Downs, that season may begin in May and end in September. On the coast, June will be the safest month to work in, and August the latest. Farther North the season is shorter still. In any case, the coldest months must be availed of. Especially does this advice relate to the curing of hams. If these are not thoroughly cooled they will not take the salt properly. Hams are worth 1s. per lb., so it will evidently pay to exercise great care in properly curing them. When the pig has got quite cool is the time to cut it up. The meat then should be hung up and left to cool further during the night, or even longer. We have given many recipes for the curing of bacon and hams, and now we give one which is the outcome of long experience of a South Australian farmer. This is his method, which he has found very successful:—

The first factor to success in this work is to kill the pigs at the proper season of the year. This must be in the cold season, as the hams must be thoroughly cooled, or they will not take the salt properly. His practice was to hang the meat out for one night, and if not sufficiently cold in the morning he put it out the second night. The hams should always be cut to nice shape. No rough edges, rags, or pieces only partly cut off should be left. For pickling he had two cases of solid wood made to hold the brine. One to hold the meat from one pig was 2 feet 4 inches by 1 foot 3 inches by 15 inches, and the other 4 feet 3 inches by 2 feet 3 inches by 18 inches; this latter is sufficient for two pigs. The case should be made watertight by soaking it thoroughly. He then mixed sufficient salt with about one-twentieth of its weight of saltpetre. A thin layer was sprinkled on the bottom of the case, the hams first rubbed well with the mixture, and then packed with flesh side upwards. Plenty of the mixture was packed on top, especially about the exposed bone. The sides and flitches are similarly treated, and packed in layers with flesh side upwards,

except that the top layer is reversed. The sides and corners of the case are packed with pieces of pork, and then brine is added. He made the brine thick enough to float an egg; then, when it was quite cool, it was poured over the pork until it was just covered. The contents of the case should be turned over about once a week. The flitches of bacon should be left in pickle for two weeks, then taken out and immersed in fresh water for twelve hours, after which they should be hung up in the smoke-house. The hams should remain in pickle up to six weeks, and afterwards soaked in water for twenty-four hours. When taken out of the water the sides and hams should be laid on a table and the skin side rubbed with the hand to secure a soft surface free from wrinkles. They should then be hung in the smoke-house. If the smoke is regulated properly, two or three days will suffice. Each must judge for himself when the meat is smoked sufficiently. He preferred to have it a brownish-yellow tint. For smoking he used only moist chips from the woodheap, but care must be exercised that the chips only smoulder and do not burn brightly. He had followed this system of curing hams and bacon for many years, and the product always met with favour. He saw no necessity for the use of anything but salt and saltpetre for the pickle.

A FINE JERSEY BULL.

In our issue of October, 1902, we illustrated and gave particulars of the performances in the milking competition of three Jersey cows belonging respectively to Messrs. Beck, Chambers, and Carr. These cows, Daisy, Rosebud, and Nellie, were pitted against each other at the milking competition at the Exhibition at Bowen Park in August, 1902. The results put Mr. Chambers' Rosebud in the first place for heaviest weight of milk in forty-eight hours—$64\frac{1}{2}$ lb., with an output of $3\frac{1}{3}$ lb. of butter in the same time. Mr. Chambers also took the *Sydney Mail* special prize of £5 5s. with Rosebud. This valuable cow has since died, but she has left to perpetuate her good qualities the subject of the present illustration, in the shape of the fine young bull "Rosebud's Pride," which took second prize in Class IX. (over 6 and under 15 months' old), at Bowen Park, in August, 1904. Rosebud's Pride is now over 2 years old, and hence will compete at the next Exhibition in the under 3 years class.

Mr. Chambers' dairy herd is located at Yeerongpilly.

ORANGE WRAPPING MACHINE.

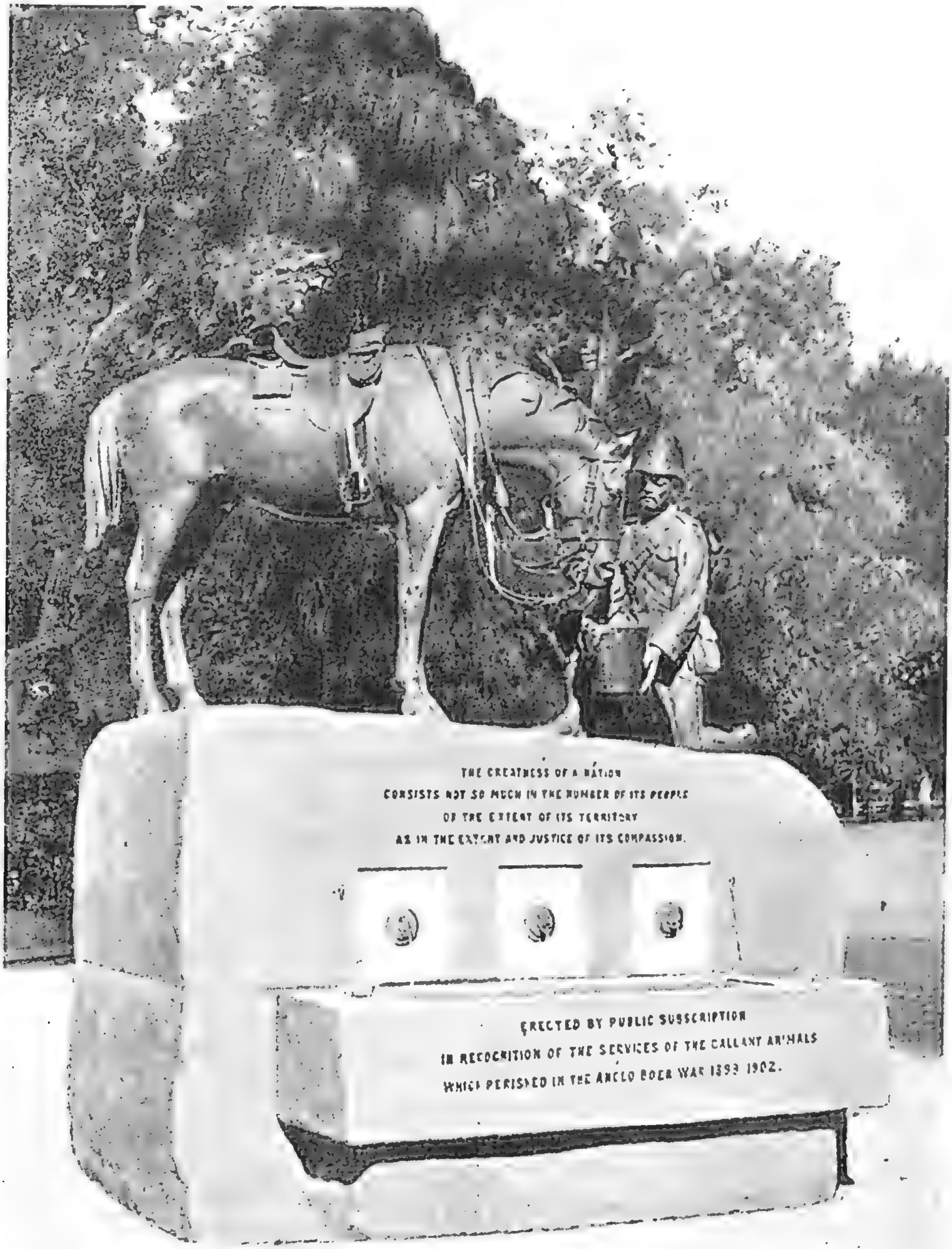
The wrapping of oranges in paper in countries which do a large export trade is a business entailing considerable expense to the grower. Although it may be some time yet before the problem of landing large consignments of oranges in London from Australia in perfect condition has been solved, yet growers may as well be made aware of the fact that a machine has been invented in America which will not only wrap the oranges but will do so at far less cost than by the present hand method. A paragraph in the *Pomona Progress*, California, conveys the following information on the subject:—"Mr. and Mrs. Milton H. Ballard, of Lynn, Massachusetts, visited for a short time yesterday the latter's cousin, Miss Wright, of the Western Union office. Mr. Ballard is an engineer for the Tripp Fruit Wrapping Machine Company located at Lynn, and will spend the winter in California in introducing and installing a new orange wrapping machine which has just been put on the market. It is claimed that the new machine does the work of many hands in wrapping successfully the fruit, and that it will revolutionise the packing houses of Southern California when installed. The company has great faith in the success of its machine, and has sent six men to represent its interests during the orange shipping season."

Plate XIX

ROSEBUD'S PRIDE -AGE, 2 YEARS 3 WEEKS.

ROSEBUD, DAM OF ROSEBUD'S PRIDE.

Plate XX.

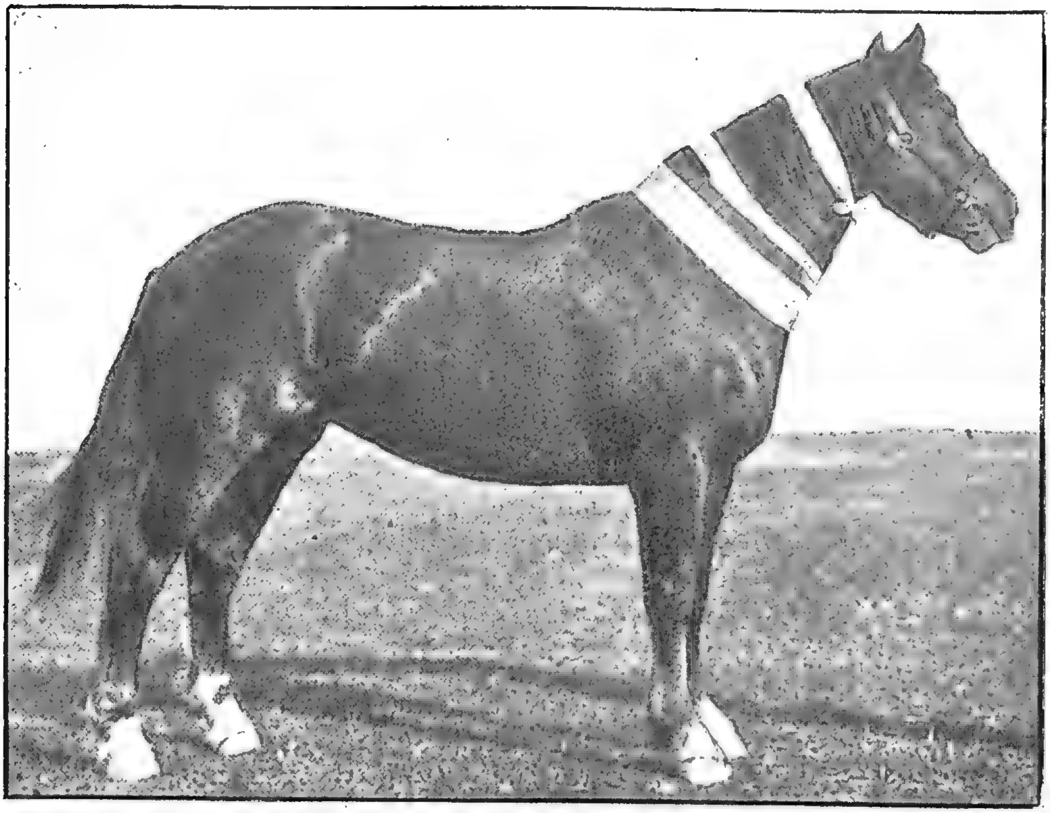


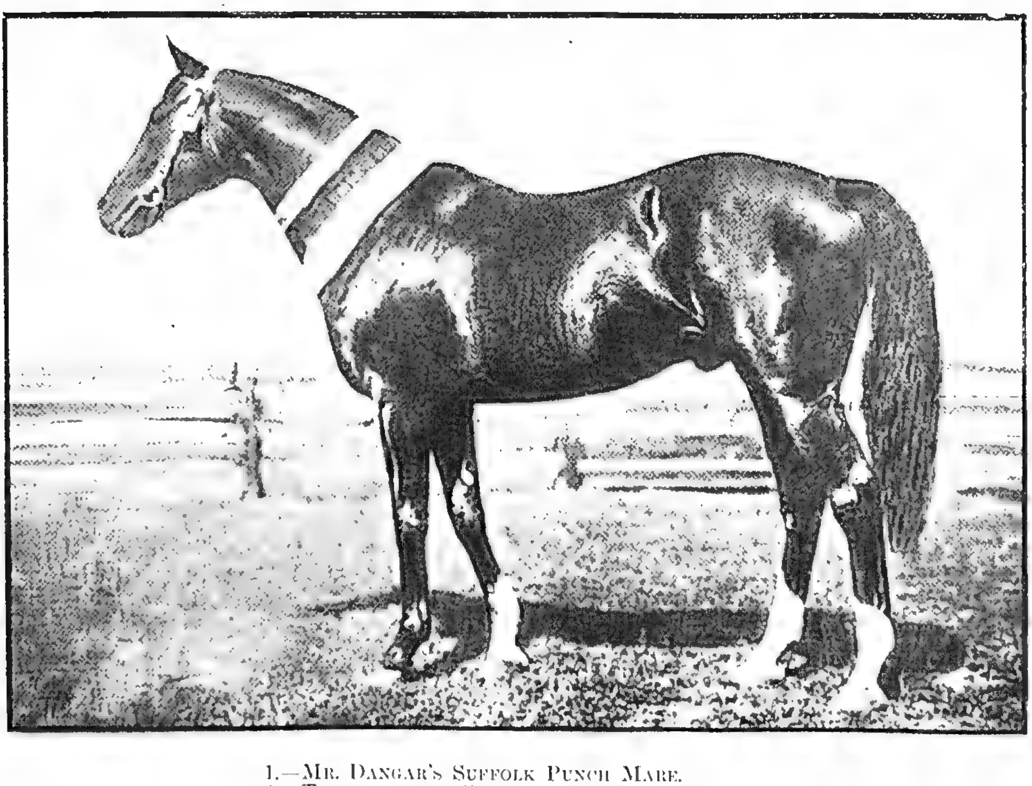
he Cape Times.]

THE HORSE IN WAR.

MONUMENT IN MEMORY OF FALLEN HORSES ERECTED AT PORT ELIZABETH, SOUTH AFRICA.

Plate XXI.





1.—MR. DANGAR'S SUFFOLK PUNCH MARE.
2.—THOROUGHBRED STALLION, SIR FOOTE (IMP.).

The Horse.

THE HORSE IN WAR.

The accompanying illustration, which we take from the *Pastoralists' Review*, and which originally appeared in the *Cape Times*, will doubtless be of interest to that large number of our younger readers who went to South Africa with the various Queensland contingents. It represents a statue erected at Port Elizabeth, South Africa, to commemorate the services of horses which perished in the Anglo-Boer war. Hundreds of these noble animals left the shores of Queensland never again to behold the rich Western plains on which they were bred. Doomed to harassing work, often, like their masters, on very scanty food, suffering every form of fatigue, disease, cruel wounds, and death, these faithful animals performed their work patiently, and contributed largely to the successful issue of the war. It was a thoughtful and generous idea, which culminated in the erection of this handsome, unique monument to the memory of the noblest quadruped on this earth.

SALEABLE HORSES, AND HOW TO BREED THEM.

By ERNEST A. SMITH.

The large export trade in horses which has arisen within the last two or three years has caused public attention to be directed to this very important subject. In many portions of the State, but more particularly at Toowoomba, frequent sales have been held, at which all the best and most saleable stamp of horses have been secured by the "export" buyers. The inferior sorts have either not been sold or have gone into local consumption, for which, apparently, anything is good enough. The particular attention paid to Queensland has been caused by the fact that the "export" buyers can no longer obtain horses of suitable stamp from Victoria or New South Wales, except at prices commensurate with their local value. In Queensland, however, the supply of horses has for years far exceeded the demand, and thus the "export" buyers have been enabled to obtain horses of the required stamp at prices much below those current elsewhere. As has been known for some time, and as I have often pointed out in these columns, our supply of saleable horses was decidedly a limited one, and judging from the published reports of sales during the last few months, very few animals of the required stamp have been coming forward. This is not altogether to be regretted, for it betokens that we have reached a crisis at which either the Queensland horse trade is to be diverted into a profitable channel or abandoned altogether. Up to the present, this trade cannot be considered to have been profitable to breeders, for if we take last year's report of the Government Statistician, it appears that the total excess of exports over imports during 1903 comprised only 8,648 horses, of a value of £76,509, equal to, say, £8 17s. a head, a price which is surely inadequate to give a fair and reasonable profit to the breeder.

The present condition of affairs may be summarised as follows:—

First, that the supply of horses suitable for export is running short. Secondly, that the prices obtained by horse-breeders have, up to the present, been quite inadequate. Thirdly, that the sale for export of our best stamp of mares has been detrimental to the best interests of the State. Lastly, that it is advisable that horse-breeding on a fixed system be adopted, in order to secure the production of saleable horses, so that Queensland may in future be distinguished for the quality, and not, as heretofore, for the quantity of horses bred within her borders.

Saleable Horses.—These may be divided into two classes—light harness horses, suitable for gunners and similar purposes, and saddle horses, suitable for remounts. (I do not speak here of heavy draughts, as such are never likely to be exported.) Now, with regard to light harness horses, the breeding of these has hitherto been that of a haphazard nature, as they have been generally the progeny of a draught mare and a light stallion, or *vice versâ*. Our saddle horses are generally by thoroughbred sires out of light mares, many of which were entirely unsuitable to breed animals of a stamp approved of by a remount agent, whose essentials are comprised in soundness, shape, and bone.

Probably in no other industry has there been such a divergence of opinion as to the best method of procedure, and, there being no fixed rule to go by, every breeder has done what was right in his own eyes. The result has, naturally, been lamentable, for so long as horses were a drug in the market, any sort of a cheap and weedy stallion was thought good enough to breed from. Generally, the ignorant breeder thought that any weedy sprinter whose leg troubles probably led to his enforced retirement from the turf, was suitable to run in the paddock with his nondescript mob of mares. The result has been, naturally, the general average deterioration of the horses bred in this State. Another cause of deterioration in the more closely populated districts has arisen from a farmer and selector sending a good-looking but doubtfully-bred mare to a good thoroughbred stallion, who was serving mares, say, at £5 5s. per mare, and, if the progeny was a colt, keeping him as an entire, and standing him in competition with a sire, at a fee of a few shilling. This was done, to my own knowledge, twenty-five years ago on the Downs, and is, I understand, a practice prevalent up to the present time.

Now, what we have to aim at is, to produce horses that will be noticeable for soundness, strength, and symmetry. And here I would first lay down the axiom: Never use anything but a purebred sire. Fancy breeds, such as coachers and hackneys, will never breed true to type, for the simple reason that they are artificial productions, bred in the old country by rich men, who can afford to indulge in an expensive hobby. But, to use such to the ordinary run of mares in this State is not only to court failure, but to deteriorate still further the already impure strains possessed by the average Queensland horses.

The Parliamentary Select Committee which met in August, 1903, under the presidency of the Hon. J. T. Bell, gave particular attention to this phase of the question, for one of its recommendations was: "That Government stallions of Suffolk Punch and stout thoroughbred type be stationed where practicable, and be at the service of mares owned by the public at a low fee." This excellent recommendation was based on the evidence given before the committee, and, as is was the expression of the opinion of well-qualified men, it is certainly entitled to all respect. The reasons for their belief are not far to seek. In the first place, both Suffolks and thoroughbreds are undoubtedly pure breeds, the Suffolk being the perfection of a clean-legged, active farm horse, possessing bone, strength, and substance, together with the powerful quarters and sloping shoulders indispensable to good action. Such a stallion is similarly fitted to use with light mares, for their progeny should be of the stamp required for gunners or light harness purposes. The colts thus obtained should be gelded, while the fillies, if up to the required standard, should be retained for stud purposes to mate with a stout thoroughbred. Horse-breeders, however, will well understand that success greatly depends on the mares first, and that the culling of these is absolutely necessary if success is to attend our efforts.

On another page will be seen a likeness of the Suffolk Punch mare exhibited by Mr. Dangar at the recent Metropolitan Show of New South Wales, and here will be seen all the excellent points of the breed which demonstrates its utility for crossing and improving inferior stock.

On the same page will be seen the likeness of the thoroughbred stallion Sir Foote (imp.), who worthily obtained first and champion prizes at the same show. In this splendid specimen of the thoroughbred will be seen size, power,

and substance, combined with that excess of quality which, as every horseman knows, means prepotency, courage, and endurance. It is these essentials that cause the thoroughbred sire to be the one and only source from which improvement in our saddle horses can come. A great many people run away with the idea that a thoroughbred stallion must of necessity be the leggy, weedy sprinter, good for racing over five or six furlongs and nothing more, and this idea is all the more widespread as undoubtedly a large number of ignorant breeders have used such animals as sires on account of their cheapness. The thoroughbred whose use I advocate is of a very different type. He should be a horse probably a little broad in the chest, with good sloping shoulders, powerful quarters, short back, and with good bone, measuring well below the knee. Such are, more often than not, racecourse failures, more or less, because, though possessing substance and stamina, they are not suited by the short courses over which the majority of our races are, unfortunately, run. There are a certain number of this stamp obtainable in Australia to improve the breed, but, as they are not so common, they are generally appreciated, and are sold at fair prices. Such thoroughbred sires, when mated with mares of breeding and substance, should produce remounts of excellent quality, which should sell readily at remunerative prices. The difficulty that faces us is not so much in the finding of suitable stallions as that our mares are very generally of indifferent quality, and this is the reason why the mating of the stout thoroughbred with a mare sired by a Suffolk Punch stallion out of a light mare is the most likely to fulfil the required conditions. The breeding of suitable mares is one that takes time, and therefore there should be no delay in making a commencement.

The subject is one that could well be enlarged upon but that the exigency of space forbids.

THE CITY STATE IN AUSTRALIA.

The *Westminster Gazette* recently published an interesting article on what is acknowledged in Australasia to be an unsatisfactory feature of Australian life. We have millions of acres in Queensland alone of the most fertile land in the world, easily accessible by rail and road, and close to the many seaports of the State, yet the cities continue to be over-crowded. The journal mentioned says:—

To the fine old crusted Tory, who has "no patience with such new-fangled ideas," the present condition of Australia is a stock example wherewith to point a moral. But among the many reasons given for the situation there is one which seems to have escaped the general attention, and that is the influence of the City State in Australia. History, of course, never really repeats itself, and historical parallels cannot be pushed to their extremes. But within these necessary limitations there is a curious resemblance between the ancient City State system of Greece, as typified by Athens, and the Australian Commonwealth of to-day.

Australia as a land of City States, in the academic sense, may be a new idea to many who picture all colonials as swarthy, isolated bushrangers. But look for a moment at the statistics. Almost half the Victorians live in Melbourne, Ballarat, and Bendigo. Sydney contains over a third of the New South Welshmen. Four-fifths of South Australia's population are estimated to be living within 50 miles of Adelaide—and South Australia embraces between 800 and 900 thousand square miles! Of Queensland's half-million inhabitants, Brisbane and its environs claim 120,000 souls, while even in New Zealand, the most decentralised of all the Australasian colonies, 230,000 people—that is to say, over a quarter of the population—live in four towns of fairly equal size. And, again, taking Australia as a whole, we find that in 1901 in its six capitals were living 1,332,072 people, and that Sydney and Melbourne, each containing over half-a-million inhabitants, held over a quarter of the total population. These figures show clearly enough what an outstanding feature of Australia is town life.

Poultry.

FOWLS ON THE FARM.

By D. MACPHERSON, Manager, Biggenden State Farm.

I have often heard the expression: "What a pity the fowls do not run here," used in connection with a crop, the seed of which has shed in harvesting, or which is being injured by insects.

Fowls can be got to run on any portion of even a small farm if a portable fowlhouse is used. One built on 6-inch by 2-inch hardwood runners, 6 feet wide by 8 feet or 10 feet long, can be easily shifted by two horses. Galvanised iron for roof and three sides is probably the best material; the fourth side could be wire netting, and the floor 3-inch by 1-inch battens. I have one of this description on the farm, size 6 feet by 6 feet, and it holds 30 fowls comfortably. These 30 fowls have been in this house since New Year, and have entirely gleaned their own living, the only time I feed them being the first time I let them out on a new run. A good supply of water, under shade, close to the house, is the only attraction I offer them.

While the portable house is sometimes not more than 10 chains from the main buildings, the fowls only once found their way there, and then only after they had foraged out the immediate neighbourhood of their house.

In a sorghum or broom-millet patch they are invaluable, as they gather all fallen seed, and thus greatly help the work of cleaning the land for the next crop. Before the present plague of grasshoppers reached the flying stage, it was specially remarkable that round the portable fowlhouse there were very few, and even after they took to the wing the fowls kept them off such low-growing plants as pumpkins, &c.

Even if poultry-rearing were not a source of income, it would be good business to fill an incubator with eggs in the early spring if for no better reason than to have a crowd of young fowls running about the cultivation during the summer and autumn months.

The cost of 10 dozen eggs and a tin of kerosene is not a big price to pay for from 50 to 100 such energetic insect-destroyers as young fowls.

It will occur to most that a good fowl will catch as many insects as a mongrel, and is more likely to prove an asset, if, as is probable, it is desired to dispose of some of them during the winter.

In shifting the house it is necessary to shut the fowls in at night, and next morning draw the house to its new stand. Allow the fowls half an hour or so to settle, then throw some feed round the door and let them out.*

VALUE OF KEROSENE IN POULTRY-KEEPING.

Kerosene is sure death to lice, if put in spray. Spray walls, roosts, corners, and nestings, and it will kill all lice and vermin as sure as the work is done. We sprinkle the bottom of the nest with it, and cover with a heavy coating of soft straw.

Kerosene is also very valuable in preventing and curing scale disease in fowls. If kerosene is used freely on roosts once a week, you will have no scaly legs, and at the same time it promptly works annihilation to the pesky red louse that preys on the fowls at night, sapping the very life's blood from their veins, and retiring to roost poles during the days.

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* When the house is moved, it should be to a considerable distance, as fowls will invariably try to get to their last camp.—Ed. *Q.A.J.*

Kerosene, if used in combination with lard or butter, and applied in limited quantities on the heads and wings of chicks and turkey poults, a large number of promising fowls will be brought up to maturity which otherwise would succumb to the ravages of lice.

When the chicks are dying apparently without cause, and the weather is unusually damp and cold, feed a tablespoon of kerosene in three or four quarts of warm mash; it will put new life in them, and they will thrive, and meet the consequent dampness following constant rains more bravely.

When fowls begin to sneeze and show signs of roup, or even acute cold, use a tablespoonful in a gallon of water, and do not permit fowls to use any other water, and note how quickly the afflicted fowls will recover.

Kerosene, a small amount of sulphur mixed with lard or butter, and greased around the eyes and on head of fowls afflicted with swell head, caused from roup, will soon bring about a permanent cure. Kerosene can not be too highly recommended in the keeping of poultry. If used as above recommended, it will be found a very valuable article.—*Exchange.*

QUEENSLAND POULTRY IN THE BRITISH MARKET.

The shipment of Queensland poultry per "Damascus" was placed on the London market, with the following result:—Ducks realised 2s. 6d. to 2s. 9d. each; best chickens and capons, 3s. 3d. each. Turkeys, 7d. to 9d. per lb.

Comparing these prices with those we quote each month in the *Journal,* they are certainly very encouraging, in view of the fact the ducks were not really as good as we can send. Turkeys were sent almost out of season, and in the case of the chickens, although good, they are not of a class that can be sent regularly, not being bred specially for export, nor were any of the birds specially fattened, so there is plenty of room for improvement and higher prices. It is pleasing to known that the tentative shipment through the medium of the Department of Agriculture and Stock has proved successful as to prices. The Department having shown the farmers and poultry-breeders what can be done, it now lies with them to work the business for all it is worth, and keep up regular supplies of birds, properly bred and fattened for export. This trade requires no spoon-feeding by the Government. The way has been shown, and poultry-breeders can now work it up themselves.

POULTRY NOTES.

"The following questions," says Mr. Fern, Poultry Expert to the Department of Agriculture and Stock, "are being continually asked at my meetings. I therefore think it well to give the replies once for all to the poultry-breeders, who are, or certainly should be, recipients of the *Queensland Agricultural Journal:*—

"(1) How long will eggs remain fertile after removal? About ten days.

"(2) What number of females should be mated with the male bird? No hard and fast rule can be laid down. A great deal depends on how the male bird distributes his attention, and also on seasons. During the early months (May, June, July) five females would be enough; later on, the number could be doubled.

"(3) Will the fact of a male running with crossbred hens influence his progeny when he is afterwards mated to purebred hens? I think not. I have had black hens running in a pen of purebred White Wyandottes, and eggs hatched from the white hens showed no trace of cross, although the male was running with both pure and cross hens.

"(4) Can the breeding of sex be regulated or controlled? No; there is no system, so far, that can be relied on. The usual method is, if pullets are wanted, to mate a two-year-old cock to one-year-old pullets, and give him a good number to run with. To produce cockerels, young, vigorous cockerels should be mated to two or three-year-old hens. Neither system can be relied on.

"(5) Can sex be determined in eggs before hatching? No. There is a fortune awaiting the person who can establish a certain rule to govern this.

"(6) When fowls are found with black combs, and hang about and then die, what ails them? Is there any remedy for fowls that are suffering from liver troubles, probably brought on by feeding too much whole corn or heating food and lack of grit to grind food? If noticed early, a cure may be effected. Give a teaspoonful of castor oil, or add half teaspoonful of sulphate of magnesia for each bird in the drinking water; then change the method of feeding. If they do not respond to this treatment use the axe.

"(7) What can I do to get rid of warts? Breed early, and you will have no late hatched chicks to catch warts or any other disease that is going. On first appearance of warts, isolate the affected birds, and give all the birds, both sick and well, Epsom salts—half a packet to a quart of water placed in the drinking vessels. Rub a mixture of vaseline and kerosene and a little sulphur on the warts, or a few drops of carbolic instead of kerosene may be given about twice a week.*

"(8) Could you give us a good fattening food for fowls for export?

	lb.
1. Ground oats	1
Skim milk, butter-milk	1½
2. Ground oats	1
Ground buckwheat or wheat	2
Ground corn (white preferred)	1½
Skim milk or butter-milk	7½
3. Ground oats	4
Ground barley	1
Ground wheat	1
Skim milk or butter-milk	7½

Pen the birds up in a coop for ten to fourteen days. Malt, not up to malting standard, can be procured cheaply from breweries. It makes a splendid food for penned fowls, and, being partly digested, could be used with any of the above mixtures.

These rations can be used and can be varied to suit different localities. Use the grain that is cheapest, and balance up as shown. Oats are good as a basis on account of their fattening qualities and the fact that this grain improves both the flavour and texture of the flesh.

When potatoes are cheap, a good ration consists of—

	lb.
Cooked potatoes	3
Ground maize	3
Ground oats	4
Dried blood	½

moistened with skim milk.

* We have cured bad cases of warts by dipping the birds' heads twice a day in $CO(NH_2)_2$ olution.—Ed. *Q.A.J.*

The Orchard.

PARASITE OF THE CODLIN MOTH AT WORK.

The long heralded and much advertised parasite for the codlin moth is at last at work in the orchards of California. The first distributions were made during the past week, eight colonies being sent out to orchards in different parts of the State, most of them going to localities in the Pajaro Valley. Other colonies will be sent out soon, distribution of the insect to be made to all of the principal apple-producing sections of the State.

Mr. George Compere, the discoverer and collector of this parasite, returned to San Francisco this week, after his olng absence in Europe, and the colonisation of the parasite is being made under his personal supervision, he and Mr. Ehrhorn having visited the various localities for the purpose of liberating colonies of the insects.

Mr. Compere, who was seen at the office of Mr. Ehrhorn this week by a representative of the *California Fruitgrower*, is enthusiastic over the possibilities of this little insect. But he does not count on mere possibilities. In his mind there is not the slightest doubt that this parasite will prove to be effective in the destruction of the codlin moth, and from the work being done by the insect in the office at the Ferry building it would appear that Mr. Compere has good grounds for his belief. In this office are a large number of jars in which the parasite is at work on its enemy, and the industry displayed by the little creature promises much for the apple orchards of California and eventually of the whole country. In every jar are a number of pieces of apple branches in which slits have been made. In these slits are the larvæ of the codlin moth, and flying about in the jars or walking about from place to place on the sticks are the parasites, busily employed in stinging the codlin moth to death, and laying on their bodies the eggs which are later to hatch out into other parasites.

This parasite, which bears the formidable name of *Ephialtes carbonarious*, is a slender little insect, the female being about half an inch long, exclusive of the ovipositor and its sheath, which are a little longer than the body of the Ephialtes. This ovipositor is very slender, and it is with this that the parasite kills the codlin moth and lays its eggs. The process is a very interesting one to watch. When the insect finds where one of the moths lies hidden under the wood, it raises the posterior part of its body into the air, withdraws the ovipositor from its sheath, and inserts it through the wood into the body of the moth, often jabbing it several times. Then as it withdraws the ovipositor it lays on the body of the moth an egg, and immediately goes in search of another codlin moth, where it repeats the process. How many eggs one parasite is capable of laying is not known, but it is probable that it lays about as many as does the codlin moth. One of the curious facts concerning the latter is that, notwithstanding the great amount of study that has been put upon it, and the large sums expended in research concerning the insect, nobody has yet determined the number of eggs that it lays. This is merely a matter of detail, one that could easily be determined by observation. That it has not yet been determined does not speak well for the carefulness of the work of some of the investigators.

After being stung it takes the moth some little time to die—about twenty minutes. The natural heat of its body is sufficient for the hatching out of the egg, which takes place within twenty-four hours after it is deposited. The larvæ of the parasite, which is a little, corkscrew-shaped animal, immedi-

ately begins to suck the juices of the body of its host, this constituting its nourishment. It goes through the various stages of metamorphosis, developing finally into a winged insect like its parent.

Mr. Compere states that in Spain, where he obtained the parasite, climatic conditions are similar to those in this State. He says that he has even found the insect at work in parts of the country where there was snow. Consequently, he is confident that it will have no trouble in adapting itself to conditions in this country. It will, however, be probably about a year before any decided results can be looked for, as it will take about that long for the parasite to become established in sufficient numbers to produce any marked effect. The success of this experiment means the saving to the country of many millions of dollars, as the destruction of the codlin moth, it is estimated, would at least double the possible production of apples.—*California Fruitgrower.*

A SIMPLE STUMP EXTRACTOR.

We have already given our readers descriptions of stump extractors, whose inventors claim that they are cheap, easily constructed, and effective. We have only seen one of these new ideas at work, and therefore can only vouch for that one as performing all that is claimed for it. That one is the invention of Mr. W. E. Thomas, of Diddilibah, described in this *Journal* in the issue of 1st January, 1903 and illustrated in January, 1904. We now have an idea for a contrivance for extracting small stumps of a diameter of about 6 inches, devised by Mr. W. R. Twine, Wooloowin—

Mr. Twine says:—"Referring to the sketch in your issue of February last of what is styled an 'Effective Stump Extractor,' I send you herewith a rough sketch of an appliance on the same principle but somewhat different in details, which combine simplicity and strength with effectiveness. (1) The lever, instead of being bolted on to the drum, which consists of a hollow log, is mortised through it, and the lever passes over the stump on which it works, and requires no support at the other end, to which a stanch and steady-pulling horse may be attached as in the other case, the lever being at a better height for pulling. (2) If the rope, instead of being fastened round the stump to be pulled, is passed under the top and hooked under a leading root at the back, as shown, the power would be much greater. The iron band, or two or three plies of strong wire, can be put round the drum near the top if thought necessary to prevent it splitting. I used an appliance as described with good effect in the Maranoa district during the late disastrous drought for pulling cattle out of boggy waterholes, but I question its effectiveness for extracting stumps of much size if at all sound, and it would be interesting to know of what description of timber the stumps* were, and how many were on the half-acre which was cleared by a man and a boy in a day."

* The stumps were ti-tree from 8 to 12 inches in diameter and green.—Ed. *Q.A.J.*

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order LEGUMINOSÆ.

SUB-ORDER CÆSALPINIEÆ.

BAUHINIA, Linn.

(Sect. *Pileostigma*, Hockst.)

B. Hawkesiana, *Bail.* (After Claude Somerville Hawkes, M.R.C.S. Eng.) Described by the collector as a large tree. Branchlets clothed by a stellate bright-brown pubescence. Leaves glabrous above, except for a rather small patch of short, dense, rusty hairs at the basal sinus, the under surface wall, and the nerves in particular, clothed with fine bristly hairs, cordate-rotundate, the larger leaves about 3 in. long and 5 in. broad, the apical sinus about 5 lines deep, with a short bristle in the centre; palmate nerves usually 9, the reticulate veins numerous and prominent. Petiole about $1\frac{1}{2}$ in. long, rusty-pubescent, with stellate hairs. Inflorescence axillary rusty-pubescent in short racemose panicles, seldom exceeding $1\frac{1}{2}$ in. in length, the peduncle only a few lines long, densely covered with bright rusty-hairy, ovate-acuminate bracts, about 1 line long; bracteoles very minute. Pedicels slender, about 5 lines long. Calyx in bud clavate, velvety, dotted with short stellate hairs, tube or entire portion about 1 line, segments 5, narrow linear-lanceolate, about 4 lines long. Petals about twice the length of the calyx-segments, the laminæ much undulate, tapering into distinct claws. Stamens 10, all fertile, inserted in a dense ring of light-coloured glandulous hairs; filaments slightly hairy, alternately long and short, the longest scarcely exceeding 2 lines, slender. Anthers oblong, about 2 lines, long, rather broad; style scarcely longer than the calyx-lobes. Stigma peltate often rather large, with a more or less undulate margin; style and ovary velvety, the short stripes less velvety. Pod (unripe) $4\frac{1}{2}$ in. long, $\frac{3}{4}$ in. broad at the upper or broadest part; style and stigma persistent, stripes on pod about 4 lines long, indehiscent, the seeds embedded in the strong fibrous substance of the pod.

Hab: Coen, *Mrs. R. W. Garraway*, at whose request it is named as above. April, 1905.

Order ROSACEÆ.

TRIBE RUBEÆ.

RUBUS, Linn.

R. fruticosus, *Linn.* British Blackberry, or Bramble. A straggling shrub several feet high, often forming dense thickets. The branches erect or arched, often rooting at their extremities, armed with prickles either stout and hooked or thin and straight, with stiff hairs or glandular bristles, or short down, all variously intermingled or occasionally wanting. Stipules subulate or linear, inserted a short way up the leafstalk. Leaflets rather large and coarse, either 3 or 5, the 2 or 4 lower ones inserted together at some distance below the terminal one, ovate, toothed, more or less downy, the midribs as well as the stalks usually armed with small hooked prickles. Flowers white or pink, in panicles at the ends of the branches. Fruit black or very rarely dull-red, not separating readily from the receptacle, the calyx usually turned down under it, seldom closing over it.

Hab.: This British plant has strongly established itself at Killarney and some other Southern localities.

Order MYRTACEÆ.

TRIBE LEPTOSPERMEÆ.

EUCALYPTUS, L'Her.

+ **E. sideroxylon**, *A. Cunn.* (So named from the ironlike hardness of the wood.) "Murga," Box-topped and Mahogany Ironbark, Warwick, *W. Pagan.* Following the Flora Australiensis, in the Queensland Flora, this species is placed as a synonym of *E. leucoxylon*, a species I have only met with at Jimbour, Darling Downs, and these trees were identical with the *E. leucoxylon* I have known in South Australia, and there called "White Gum." Previous to receiving Mr. Pagan's specimens collected along the Warwick to Thane railway line, I had not seen Queensland specimens of the true *E. sideroxylon.* The distinction between these two species of Eucalypts is very evident when they are observed growing, as stated by Mr. J. H. Maiden in Vol. II., Part 3, of his Forest Flora of New South Wales, where he gives, in a tabulated form, the principal points wherein they differ, and a copy of which is here given :—

	E. sideroxylon.	E. leucoxylon.
Juvenile leaves	Linear-lanceolate or linear	Cordate or ovate-lanceolate, sessile
Bark	Black, furrowed and rugged (iron-bark)	Whitish or bluish, smooth (white or blue gum)
Timber	Deep-red...	Pale-brown or white (hence the name —leucoxylon)

Hab.: Along the railway line from Warwick to Thane, *W. Pagan*, April, 1905.

I may here remark that from specimens of another eucalypt lately received from the Chief Engineer for Railways, Mr. W. Pagan, I have come to the conclusion that the tree mentioned by Baron Mueller in his Eucalyptographia as a Queensland tropical coast variety of *E. largiflorens*, F. v. M., might with advantage be placed in specific rank, but my specimens at present are insufficient for the purpose of giving a suitable description. The same remarks apply to another eucalypt, a variety of bloodwood, of which the fruits are of a more fleshy nature than any of the gums with which I am acquainted. I purpose, when specimens are available for the purpose, describing it under the name of *E. terminalis, var. carnosa.* My first specimen I obtained about twenty-five years ago on the Darling Downs (branchlets with unripe fruit), after which I received specimens with unripe fruit for naming from Mr. Edgar, Rockhampton, and recently from Mr. Pagan, from trees growing near Central Railway line, 74 miles from Rockhampton. The fruit on these were also unripe.

Order LYTHRARIEÆ.

LAGERSTRÆMIA, Linn.

L. Archeriana, var. glabrescens. This variety differs from the normal form in the leaves being more acute and nearly or quite glabrous. The flowers seem also smaller.

Hab.: Walsh River, *T. Barclay-Millar*, March, 1891. Coen, *Mrs. R. W. Garraway*, April, 1905. The Walsh specimens are scarcely as glabrous as those from the Coen.

Order RUBIACEÆ.

MORINDA, Linn.

M. citrifolia, *Linn.*, **var. bracteata.** Stipules more acute than in the normal form, and often bear at the base of the syncarp an involucral-like ring of narrow lanceolate bracts of from ¾ to 1 in. long, syncarps glabose, about 1 in. diam,

Hab.: Coen, *Mrs. R. W. Garraway*, April, 1905. This variety is met with in other tropical countries, but the present is the first time it has been noticed in Queensland.

Plate XXII.

BLACK KAURI PINE. (*Podocarpus Ladei*, Bail.)

Order COMPOSITÆ.

Tribe Cynaroideæ.

CARDUUS, Linn.

C. nutans, *Linn.* Musk thistle, welted thistle. A tall biennial cobwebby thistle, 1 to 3 ft., stem usually simple, grooved, and interruptedly winged, wings spinulous. Leaves 6 to 12 in. long, entire on pinnatifid waved spinous. Flower-heads ¾ to 1½ in. diameter, solitary or fascicled, hemispheric or sub-campanulate, inclined or drooping. Involucral-bracts subulate-lanceolate, outer or all terminating in a spreading, erect, or reflexed spine. Flowers of a somewhat crimson colour. Achenes pale-brown, glabrous, granulate. Including *C. acanthoides*, Linn., which our plant represents rather than the normal form.

Hab.: Introduced and spreading in some localities along the Brisbane River. The species is common in Europe and temperate Asia.

Order CONIFERÆ.

PODOCARPUS, L'Her.

P. Ladei, *Bail.* Plate XXII. (After F. W. H. Lade) Mount Spurgeon Black Kauri Pine. A large erect tree, the trunk attaining a diameter of 6 or more feet. Bark somewhat thin, reddish-brown, smoothish, exfoliating in comparative thin scales. Leaves distichous, falcate, about 6 or 8 lines long, 1½ to 2 lines broad, usually obtuse, the midrib not always prominent, both faces green, almost or quite sessile. Male amenta not to hand. Fruit nearly sessile, solitary at the ends of the branchlets, about 1 in. long, pointed, somewhat tapering at the base, but none of the fruit to hand fully matured, putamen or endocarp thick.

Hab.: Mount Spurgeon, Mitchell River, Port Douglas, *F. W. H. Lade.* Leaf specimens, December, 1902; immature fruiting specimens, May, 1905. In many respects the specimens of this new species remind one of the "Miro" or Black Pine of New Zealand, *Podocarpus ferruginea*, Don. This second species of the gums peculiar to tropical Queensland is not only valuable as an addition to our large timbers, but might be found useful for ornamental planting.

Order AMARYLLIDEÆ.

Tribe Amarylleæ.

CALOSTEMMA, R. Br.

C. Scott-Sellickiana, *Bail.* (Named, by request, after Mrs. Stephen Scott-Sellick, a sister of the discoverer of the plant.) Bulb globose, about 1 in. diam. Leaves usually lanceolate, tapering into a rather long stalk, lamina 4 to 6 in. long, ½ to 1 in. broad, texture firm, sometimes almost coriaceous, midrib prominent, the oblique parallel nerves 4 or 5 on each side, somewhat prominent, some of which coalesce with the midrib before reaching the stalk portion, transverse reticulations rather close. Scapes from a few inches to over 1 ft. high, when short usually very slender, bearing an umbel of numerous small white flowers. Involucral bracts 3, 1 in. or more long, tapering from a broad base to thread-like points, bractioles or interior bracts thread-like. Pedicels slender, about ½ in. long, ovary globular, 1-celled, 2-ovulate, about 2 lines diam. Style slender, slightly longer than the corona, stigma shortly 2-lobed. Perianth tube 2 to 3 lines long; segments patent, ovate, veined, about 3 lines long, perhaps larger in the fresh flowers. Corona-tube 2½ lines long, prominently striated, lobes broadly-linear, emarginate or shortly lobed, about half as long as the tube. Filaments incurved long as the lobes of the corona. Anthers rather thick, scarcely exceeding 1 line long, lobed at base.

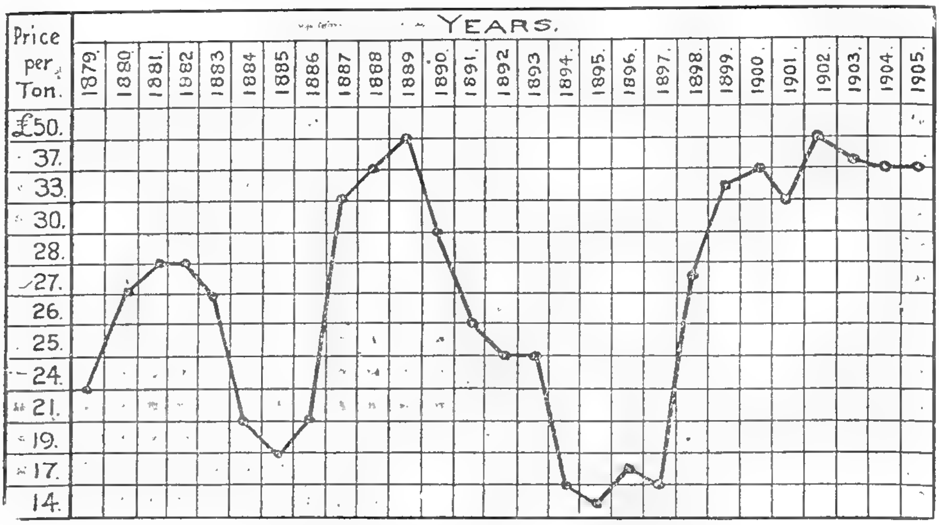
Hab.: Coen, *Mrs. R. W. Garraway*, March, 1901. *Miss F. Armbrush*, January, 1905.

Tropical Industries.

THE FLUCTUATIONS IN SISAL HEMP PRICES DURING TWENTY-FIVE YEARS.

The following interesting article appears in the January number of the *Journal d'Agriculture Tropicale:—*

The diagram on which this article is merely a commentary is borrowed from a recent number of the *West Indian Bulletin*, the excellent quarterly journal of the Department of Agriculture of the British Antilles. That department is interesting itself in the development, in all suitable localities, of the cultivation of sisal hemp, which industry is already firmly established in the Bahamas, and in a less degree in the Turks Island and the Caicos Archipelago.



Already, on several occasions, large quantities of sisal plants have been introduced into Jamaica and Trinidad, but the experiments appear to have been carried out in a half-hearted manner in those islands. It is probable that further experiments will be made under more favourable conditions. Meanwhile, the Department has just published an excellent bulletin of about twenty pages on this subject. The author of this bulletin has rightly given a relatively important place to the consideration of markets and prices, and we think it will be of interest to reprint that portion of the article in question, especially as we are in a position to furnish later information gathered from other sources.

"In 1888 and 1889, owing to the formation of the National Cordage Trust in the United States, and the efforts made to control the entire supply of white-rope fibres, the price of sisal was extraordinarily high. This was a purely artificial state of things, and had no reference to the ordinary market value of the fibre. The average price in 1877 was £33 per ton. In the beginning of 1888 it rose to £36 10s., but towards its close, owing to the action of the Cordage Trust, it went up to £45 per ton. In January, 1889, it reached £50 per ton. This was unprecedented; but in March of that year it went higher still, and reached a maximum of £56 10s. per ton. At this price two bales of Bahamas sisal happened to be sold in the London market. This circumstance really did harm to the prospects of the industry, as it stimulated over-production in Yucatan. The two bales in question were bought at this fancy

price for a special purpose—viz., for making ladies' hats and bonnets. The consumption for this is so trivial as to be hardly worthy of notice. Soon afterwards the Cordage Trust came to grief, causing serious loss, if not ruin, to a large number of people in the States. The large stock of fibre held by it, coming suddenly on the market, prices fell so rapidly that at the end of 1890 good fair fibre was sold at £27 10s. per ton. In 1891 it was further reduced to £23 10s.; in 1893, to £20; in 1894, to £15; until in July, 1893, it reached the lowest price it had ever reached. This was £13 per ton, or a little less than 1½d. per lb. Since that time it has improved."

In 1896 it was quoted at £17 to £17 10s. per ton, and from that date the price steadily rose, as will be seen by the diagram, till, in 1902, it reached £37 per ton. To-day, 1905, it is quoted variously at from £33 to £35 to £38 per ton, according to quality.

The prospects of the industry for Queensland planters are eminently good. As we have already pointed out in previous issues of the *Journal*, the cost of production from the field to the market is estimated at about 40 per cent. of the value of the fibre, so that a return of half-a-ton per acre will, at £32 per ton, yield a better profit than most crops grown by farmers, sugar-cane, perhaps, excepted.

We have added the quotations of £35 per ton for 1904 and 1905 to the above diagram.

HAWAII.

Notwithstanding a statement that since its annexation to the United States of North America Hawaiian industries have retrograded, it would yet appear that the sugar industry in those islands is in a very flourishing condition. Thus, the Oahu Sugar Company at the close of last crushing season finished up with a balance of receipts over expenditure of 218,679.09 dollars (£43,736, nearly), after writing off 94,000 dollars (about £18,800) as depreciation. The net profits to the shareholders for the year amounted to 226,516.86 dollars (£45,303). And yet there was a large shortage in the crop. Ewa Plantation, said to be the most important on the island of Oahu, has made enormous profits. During 1904, the Ewa mill turned out over 32,000 tons of sugar, giving a profit for the year of 872,910 dollars (£174,582); 400,000 dollars (£80,000) were paid in dividends; and 2,000,000 dollars (£400,000) were carried forward to next year. The Waialua Agricultural Company has expended 100,000 dollars (£20,000) in permanent improvement. Six hundred acres of new land will bear a crop in 1907. A dam is being constructed on the company's property which will hold, when completed, 2,500,000,000 gallons of water. Koreans now form a large proportion of those engaged in the work of handling cane.

On the windward side of the island of Oahu the sugar plantations are extending their territory, so that the most of the available agricultural land will, as is the case on the leeward side, be in sugar in a short time. Plantation railroads are being extended all over the islands. Plantations are increasing dividends, and more money is daily being put into sugar stock. During January and February the weather was unusually cool for these islands, and the growth of young cane in certain exposed districts has been somewhat retarded, but within the last week the cool spell has terminated and rain is falling, where it has been needed for several weeks. The tendency to have constructed in Honolulu plantation machinery is growing very rapidly, and whereas large contracts have been sent out of the territory, the local iron works are now receiving big orders. The Honolulu Iron Works has the contract for the construction of a large sugar-mill in Mexico.

The labour question is probably attracting more attention than anything else, as far as the plantations are concerned, at the present time. The question

in a nutshell is whether Congress can be persuaded to grant the islands some particular privilege in regard to Chinese labour, or whether the plantations will have to look to the importation of some class which will be satisfied to work in the fields for pay that will not interfere with the prosperity of the main industry of the territory. Planters are agreed that Chinese labour is the best that can be obtained.

It is conservatively estimated that Hawaii will produce and export during the year 1905 370,000 tons of raw sugar. Of this 120,000 tons will be shipped to eastern ports around Cape Horn; 100,000 tons will be transported across the continent by railroad from San Francisco; and 150,000 tons will go direct to the San Francisco refineries. Thus writes the Hawaiian correspondent of the *Louisiana Planter*. Possibly Queensland will prove a good market for Queensland sugar after 1906.

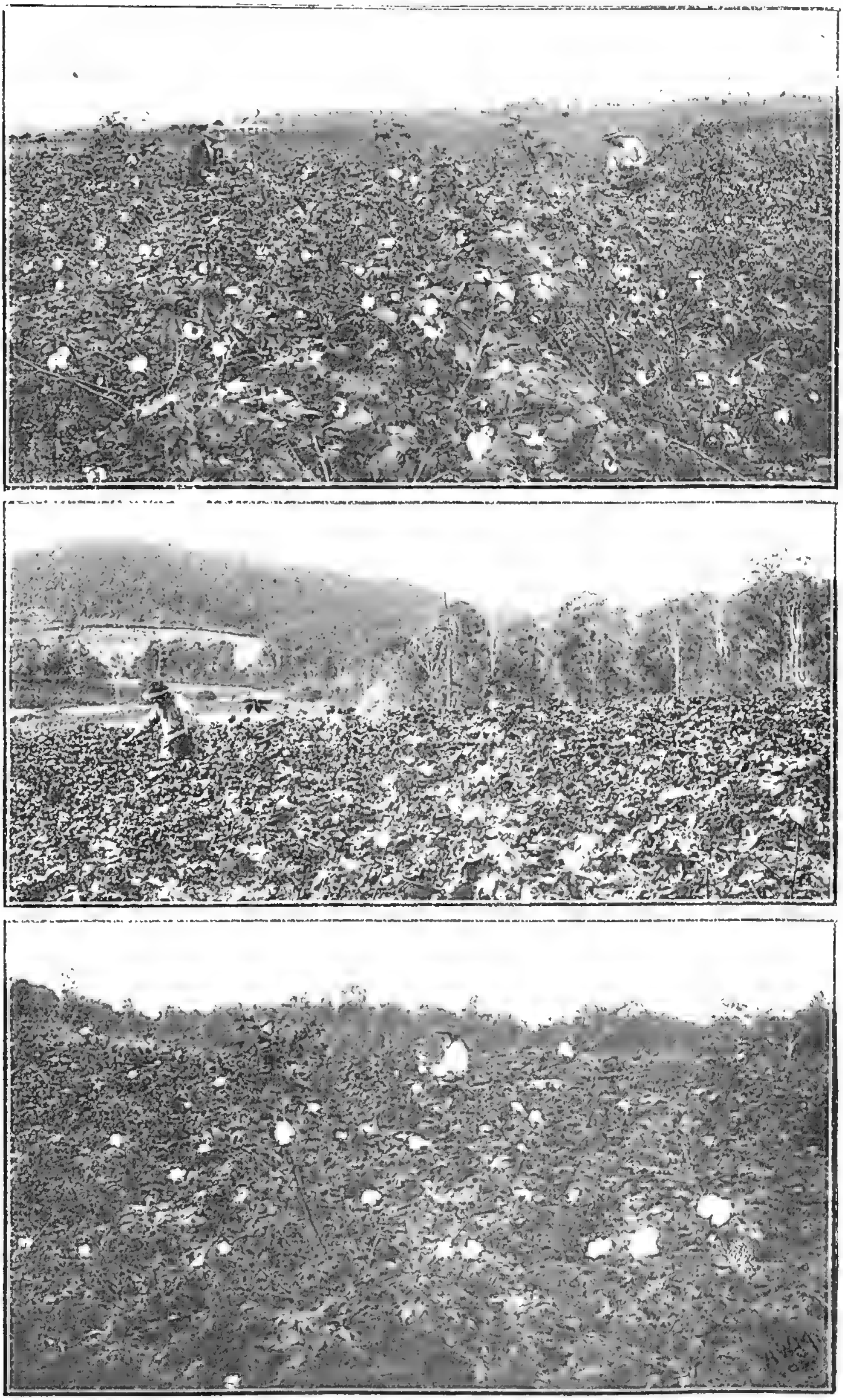
SUGAR IN THE NORTH.

The accompanying illustration will give some idea of the possibilities of sugar-growing in the Cairns and Mulgrave districts. The photograph represents a small portion of 130 acres of cane, grown by Mr. G. R. Mayers, of Cairns, during the season 1905. The cane, which is of the Goru and Malabar varieties, was planted in July, 1903, and was cut in October, 1905. The yield over the 130 acres averaged 64 tons of cane per acre. The great fertility of the soil is evidenced by the fact that the scrub land of the river flat where this cane was grown has been under cane for the past seven years, and was neither irrigated nor manured. This land was ploughed three times with the disc plough, using a 30-inch disc, to a depth of 12 inches. After the furrows were opened up, the land was subsoiled as deep as possible before planting. The cane in question was only twice trashed. The immense height of the cane may be judged by a comparison between it and the second figure from the left. This gentleman is over 6 feet in height, and by comparison there are over 12 feet of crushing cane, exclusive of the top. The total crop, at 64 tons per acre, would reach 8,320 tons. Taking the price of cane, inclusive of the bonus, at 17s. 6d. per ton (although in some instances this has reached nearly £1 per ton), the cash value of this crop amounts to £7,280. The cost of cutting and loading, at 4s. per ton, £1,624; and the cost of cultivation and trashing after planting being deducted, there still remains a very handsome profit for the planter. The cost of preparing the ground for planting cannot fairly be charged to the first crop, but must be divided between that and subsequent (perhaps four or five) ratoon crops. We may take another view of the value of such a crop. About 8 tons of cane are required to make one ton of sugar. In some instances 7 tons have yielded a ton of sugar; in others 9, 10, and even more tons of cane have yielded no more. This depends upon the variety of cane, the care with which it has been planted, cultivated, and trashed, the season of the year when cut, the sugar content of the juice, and the ability of the mill officials. At 8 tons of cane to the ton of sugar, this crop would return 8 tons of sugar per acre. That land capable of producing such crops as this should be deliberately leased to Chinese and other aliens seems incredible, yet such is undoubtedly the case. It is probably difficult to secure sufficient white labourers in the far North to deal with the large quantities of cane produced on these fertile soils, for reasons which we have already given in the February issue of this *Journal*. It is noteworthy, however, that on many small holdings in all Queensland sugar districts, where the farmer is blessed with two or three steady, hard-working sons, the whole of the work is carried out by them without the employment of extra labour—black or white. The labour problem mainly affects the large plantations, and the crux of the position will be when the kanakas have been returned to the islands. Indians, Japanese, and Chinese we shall, however, still have with us.

Plate XXIII.

Sugar-cane in the Mulgrave District.

Plate XXIV.



COTTON FIELDS.

1.—D. T. Keogh, M.L.A., Willowbank, Ipswich.
2.—W. Butler, Redbank Plains, Goodna.
3.—T. Fitzsimmons, Redbank Plains, Goodna.

COTTON CULTIVATION.

BY DANIEL JONES, Department of Agriculture.

As cotton-growing is once more engrossing attention as a crop worthy of a place on the farm, the following remarks may assist the grower to make this crop a profitable one.

I have lately noticed many instances of errors of omission as well as commission, which it is advisable to note. I have seen several areas of cotton in which the plants are growing too far apart. This will materially reduce the yield per acre; 4 feet between the rows, and 14 inches to 20 inches in the drills, is a reasonable distance. The Egyptian practice is always to leave two plants to grow together. This, I believe, is done to dwarf the growth of the shrubs, which, under the admirable system of tillage and irrigation in vogue in that country, answers very well, and results in very heavy yields of excellent cotton. Perhaps this practice of the Fellaheen might be advisable to adopt in our State, more especially in those rich lands so abundant in our coastal regions. No doubt the duplication of plants will dwarf the shrub, and prevent the undue development of foliage and wood at the expense of the fibre. Moreover, the shrub, by being thus dwarfed, is more available to the picker, and advantageous to the cultivator. So crowded do the Egyptians leave their plants that the ground must be very soon covered; hence no need or possibility of a lengthy period of tillage. The distance between rows with them is usually 35 inches, and 15 or 16 inches between the plants. With two in a hole, this means 26,000 plants per acre, a proportion vastly greater than any allowed in other cotton-producing countries. This system of tillage gives a yield of from 1,800 to 2,400 lb. of seed cotton per acre, valued at a high price on account of its length of fibre. Farmers with very rich soils should experiment in thick planting.

Some growers this season complain of slight ravages by the boll worm. This pest in former years proved very serious in some seasons, more especially as at that time no method had been discovered to cope with the evil. It is a pest which in all cotton-producing countries must be reckoned with, and in its early stages be destroyed, if possible. American growers recommend the use of London purple or Paris green. These are mixed with flour, lime, or wood ashes, and dusted over the plants. On large plantations the mixture is put in bags made of open material, such as cheese cloth or hessian. These bags are tied to each end of a pole, carried across the saddle on horseback, and jolted as the rows are traversed. Thus a large area can be treatd in a short time, and the shrubs lightly dusted with the poison in sufficient quantity to kill the grub. The most favoured mixture is one comprising 50 lb. flour, 1 lb. resin, and 1 lb. Paris green. The resin is finely ground and thoroughly mixed with the other articles. The flour and resin are recommended on account of their adhesive properties. Lime, ashes, &c., can be used, but will not adhere so well and retain the poison on the cotton pod. The Barbados Experiment Station advise using 1 lb. Paris green to 10 lb. lime, to be applied at the beginning of the season, when first the ravages are apparent. The application of Paris green in too large proportion is not prudent, as in some instances the young foliage is injured. Care must be taken in handling this arsenical mixture, but with intelligent application little or no risk is incurred. Some protection may be afforded to the cotton plant by inducing the moth to deposit its eggs in some other and less valuable crop, such as Kafir or Jerusalem corn. I have frequently noticed that this class of grain attracts the caterpillar in great numbers. The infested seed-bearing heads could be fed to pigs or fowls. This season, on inquiry of a cotton-grower as to the state of his crop, he mentioned a considerable loss owing to rain. This rather surprised me, as, although wet has been experienced to some extent, it has not, in my opinion, been sufficient to materially spoil cotton. It appears, however, that the grower had discarded about a bale as not up to standard, as the rain blackened the exposed fibre. Still, had it been injured by rain, if cotton of this class is picked and kept by

itself, no absolute loss need occur. Cotton, if not absolutely rotten, no matter if discoloured, has its market value, thanks to the Federal tariff.

During my recent holiday trip to Melbourne, I was asked for quantities of inferior cotton, which is dyed a dark colour, and used for making wadding much in demand in many of the industries. I mention this particularly, as a great fear exists that cotton may be destroyed by heavy rain. Such cotton is well worth gathering.

[In 1868, a quantity of damaged cotton, coloured black, green, and red, was ginned, and disposed of in England by Mr. A. J. Boyd, and brought almost as high a price as good cotton. Yet the farmers were throwing it away.—Ed. *Q.A.J.*]

PRUNING.

A few suggestions on the advantages of pruning the cotton shrub will perhaps not be out of place here.

In districts where severe frosts occur, it is not prudent to prune; but, as a general thing, cotton can be pruned with safety on our coastal districts. How it will endure frost in inland districts in the Southern part of the State is as yet a matter for experiment. It is, however, well known that in the Central districts cotton is a perennial shrub hundreds of miles from the coast, and is known to defy frost and drought.

The advantages attendant on pruning cotton may be briefly referred to, and are such as will commend themselves to the planter. The shrub is cut back in the autumn, before the young foliage begins to burst. The operation is usually performed with the common reaping hook, which is the most suitable implement. Our practice in the early days when cotton was the chief of crops in the Moreton district, was to lop off the head of the shrub as high as the stalk would allow. The object in cutting is to encourage the shrub to branch as high as possible to avoid limbs sprawling over the rows or lying on the soil. The cost of pruning may be set down at about 4s. per acre. The first year's pruning is usually not so difficult as the subsequent ones, owing to the dense foliage of the second and third year's plants. Whether cotton should be pruned for more than two or three years is a matter to be decided by the planter himself. Two rows are cut so as to pile one on the other; these are then thrown with a hay fork on to rows on each side. The cut branches are burnt on spaces where the bushes are poor, or where misses have occurred. The patches thus destroyed are resown as early as possible. Pruned cotton comes much earlier into bearing than plant shrubs. I have, in some seasons, begun picking by Christmas time, when plant bushes would be fully two months later. This early and longer-bearing period of pruned cotton, all things being equal, usually yields a more abundant crop. I have known an average of 1,800 lb. per acre to be gathered from plots of 30 acres.

A further advantage of pruning cotton will be the possibility of having a good portion of the crop gathered before our wet season sets in (if it does) in February or March. On the other hand, a farmer who has areas of plant cotton and pruned, will, owing to the different periods of maturing, escape excessive injury from wet, as, if the rainy season is late, the pruned cotton is safe, while if early, the advantage lies with the plant areas. Thus the farmer stands to gain by having areas of both sorts in tillage. Our practice in cleaning pruned cotton was to run a light furrow down at the side of each row of plants, throwing the soil away to lighten the process of hoeing. The efficiency of this operation is in a great measure dependent on the manner the drills have been drawn and plants sown. In instances where the shrubs are in straight lines the plough will do closer work, leaving a much narrower strip for the man with the hoe to cut down. After hoeing, this furrow is thrown back against the plants, either by the scuffler or by ploughing or discing between the rows. The plough is followed by the scuffler. Farmers who contemplate cutting out the cotton will find it practical to plough out the shrubs. Our modern plough, with its large sharp share, will make easy work of the cotton shrub.

The expenses of a pruned crop should be less than those of plant areas, as ploughing, harrowing, and sowing operations are saved.

Early Sowing.

The experience of growers this season has been that October, in some localities, is rather late for sowing cotton. If the ground is ready for sowing in September, and sufficient rain falls to germinate the seed, it is better to sow then, and take the risk of a late frost. The planter can considerably assist the germination of the seed, if needed, by soaking the seed in lukewarm water overnight. Seed thus treated will germinate better on drying soil than if put in not soaked. This system, even during the past season, would, if adopted in some cotton plots that came under my observation, have resulted in a much better stand of cotton.

The returns from many farms in the West Moreton district have, in many instances, resulted in a yield of over 1,000 lb. per acre, and a considerable part of the crop remains to be gathered. Sea Island cotton, grown inland, has, as anticipated, not yielded a satisfactory return. The staple of samples to hand is very good, drawing in length up to 2 inches, which is fully up to standard quality. The coastal district is much better suited to this class of cotton. Ginning operations on farmers' account are now being carried on at the Ipswich factory. The class of Upland cotton to hand is very good, and growers who have earnestly taken the crop in hand speak hopefully of future sowings, despite the low prices ruling of to-day, but which are, doubtless, only temporary.

THE TOBACCO INDUSTRY IN AMERICA.

The extent to which the science of agriculture is fostered in the United States of America would scarcely be credited by Australian farmers not posted up in the agricultural industry of that country. It has been said by some Australian wiseacres that we do not need experts in any business, and particularly not in farming or fruit-growing, cotton or tobacco cultivation. The Americans, who are far ahead of Australians in general agricultural science, hold an opposite opinion, as will be seen by the following extract from an American journal. Tobacco experts particularly are thought most highly of, and a salary of £600 per annum for each of many tobacco experts is looked upon as very moderate:—

The House of Representatives has passed the annual agricultural appropriation, and in it is allotted to the Bureau of Soils for mapping and studying tobacco soils the unusually large amount of 204,660 dollars. The provision relating to tobacco specifies the duties of the Bureau of Soils under this appropriation as follows:—

To map the tobacco soils of the United States; to investigate the soils and conditions of tobacco growth in Cuba, Sumatra, and other tobacco-competing countries; to investigate, in co-operation with the Bureau of Plant Industry, the methods of curing, with particular reference to fermentation; to originate, through selection and breeding, improved varieties for the principal tobacco districts of the United States, and to secure, as far as may be, a change in the methods of supplying tobacco to foreign countries; the location of the stations; rent of buildings, not to exceed 4,000 dollars per annum, for office and laboratory purposes; the employment of local and special agents, clerks, assistants, and other labour required in conducting experiments in the city of Washington and elsewhere, and in collating, digesting, reporting, and illustrating the results of such experiments; the preparation and printing of reports, drawing, and illustrations.

The Secretary of Agriculture is also authorised to engage such experts and help as may be for the best interest of the service, as hitherto the strict enforcement of the cvil service rules has hampered the Department in securing, in particular, tobacco experts. It is thought this authority will help the Department's work, but the salary of such special scientific help is limited to 3,000 dollars per annum, which is regarded as a very moderate salary."

MOLASCUIT.

We are indebted to Mr. A. M. Hertzberg for the following interesting and important information concerning the utilisation of molasses, elicited at a meeting of the East Sussex (England) Farmers' Club, and which formed the subject of an address by Mr. George Hughes (Consulting Chemist to the Agricultural Society of Barbados) on "The Cultivation of the Sugar-cane, and the Processes of Manufacturing Sugar, with Especial Reference to the Utilisation of its By-products":—

Mr. Hughes dealt with the subject in a most able manner. He first gave an interesting description of the sugar-cane, the methods of cultivation, and the process of making sugar. Proceeding, he said: "We will consider the important question of dealing with the by-products—molasses and the crushed cane. This is the point of my paper, that, I venture to think, will be of practical use to the British agriculturist as well as of much service to the sugar-cane planter.

You will remember that I told you that the crushed cane leaving the mills is called megass, and this hitherto has always been used as the fuel to boil the juice into sugar and molasses. This procedure is something akin to burning straw if it were necessary to use much fuel to produce marketable corn. Doubtless it is an excellent use for the rind, but the interior of the megass from which the juice has been expressed I found on analysis to be 75 per cent. digestible, and therefore suitable for feeding purposes. It has now been demonstrated that it is quite easy to separate what might be described as this honeycomb by disintegration and screening.

Showing a sample of screened megass-meal, Mr. Hughes said the absorbing properties of this are remarkable, but this fact is not surprising, seeing that the cells of which it is formed originally held 90 per cent. of juice.

In a paper read last year at the Institute of Mechanical Engineers, written by Mr. Williams, of the Sandwich Islands, on some new sugar machinery, a furnace was described for the purpose of burning molasses as fuel. A member who had a copy of the paper beforehand and who had to speak in the discussion, pointed this matter out to me. I said that Bulwer Lytton, in his book, "Paul Clifford," said the very worst use to make of a man was to hang him, and I thought that the very worst use to make of molasses was to burn them, and the remark was repeated in my name. Soon the Sandwich Islands will be making molascuit, and find a good market in the Western State, where in the dry seasons much difficulty is experienced in getting fodder for stock.

The crop of molasses obtained for each ton of sugar is equal to from 5 to 7 cwt., according to the condition of the juice, which is much affected by the seasons. In many places this by-produce is taken to distilleries and converted, after fermentation, into rum. Of late years the price of this commodity has been much depressed, and, if not an actual loss to manufacturers, it has barely covered the expenses of production. Molasses would long ago have been more largely used for cattle-feeding but for the expensive packages necessary for shipment, and the difficulty of handling them has been a deterrent of its coming into general use for this purpose. You cannot make a meal of molasses pure and simple, but by taking 20 per cent. of the dry megass-meal 80 per cent. of molasses is easily absorbed, and so completely that the product is not even sticky if the megass-meal be fairly dry. It can then be desiccated, and the 25 to 30 per cent. of water in molasses more or less replaced by this dry digestible megass matter.

Chemists to-day estimate the feed value of sugar on the same standard basis as starch, but I venture to think that it will be found in practice to have a much higher ratio, because it is a soluble carbo-hydrate, and I do not think, to express myself practically, any chemist would appreciate starch in his cup of tea in preference to sugar, and it is only reasonable that animals equally recognise this relish of eating this form of soluble carbon, and what is appetising is easily digested. Sugar is not a condiment, but may be described as a condimentary food.

Everyone knows that sugar pure and simple cannot be taken in any quantity at a time, because, all being soluble at once, it would soon nauseate and upset the digestion, but I will show you that molascuit slowly gives up its saccharine matter in a simple experiment by mixing water and decanting; and water poured upon the sediment one will note still yields sweetening matter. It is, therefore, practically a natural food made entirely from the one product, the sugar-cane almost in its natural state, only the cells charged with this concentrated molasses instead of original juice.

It is not reasonable to look upon this new commodity as a complete food, but it will be found a valuable addition to all other feeds in proportion to the nitrogen matter they contain. It may in time reduce the necessity of growing mangolds. The practical farmer will chaff his hay and straw and mix molascuit with this chop, and not forgetting to add the water which would have been found in his roots to the extent of 90 per cent. One ton of molascuit can equal 8 tons to 10 tons of mangolds, the feeding of which, according to analysis, is chiefly dependent upon sugar. I make this statement, gentlemen, not as a proved fact, but a point upon which experiments can be made, and certainly one that invites discussion.

During a recent visit to Norfolk, where molascuit is rapidly coming into general use, I was much pleased to visit a farm and to see steam power cutting hay and straw, and every few minutes a layer of molascuit was thrown upon the chaff heap; the result was a most appetising aromatic mixture, and this could not have possibly been the case but for molascuit, judging from the low quality of the rick top and bottom that were being chaffed.

To enlarge further upon my subject would trespass upon your time, because I want a discussion, but I must point out that this article is not being forced upon the notice of customers by expensive advertising, which the consumer must pay. I always think it is sure to be rubbish that requires continual advertising. "Good wine requires no bush," and one consumer will soon report to another if the virtues I claim for molascuit are proved by results.

The British farmer oftens pays a fancy price for compound feeds, and many of the feeds have established their reputation on the fact, although not generally known, that they contain molasses or sugar in their composition. Here you have molasses in a dry condition, admirably suited for mixing with your other feeds, be it hay, straw, or cotton and linseed cakes, &c., and molascuit should be sold at a price which means economy to the farmer.

As I have already stated, I think the future of this simple article will open up and mark a new epoch in feeding and fattening all animals in this country.

There may be gentlemen present who have used the new product, and their opinions are invited, and especially upon the point of quantities used in the daily ration of their stock, as such data are of much import to those who may be going to follow their example and make use of molascuit.

In conclusion, Mr. Hughes told the members how he succeeded in getting the late Chancellor of the Exchequer (Mr. Ritchie) to take off the import duty of £1 per ton to which molascuit was formerly subject. That was only fair, seeing that meat from Argentine, where molascuit was largely used, came in free and competed with home-grown produce.

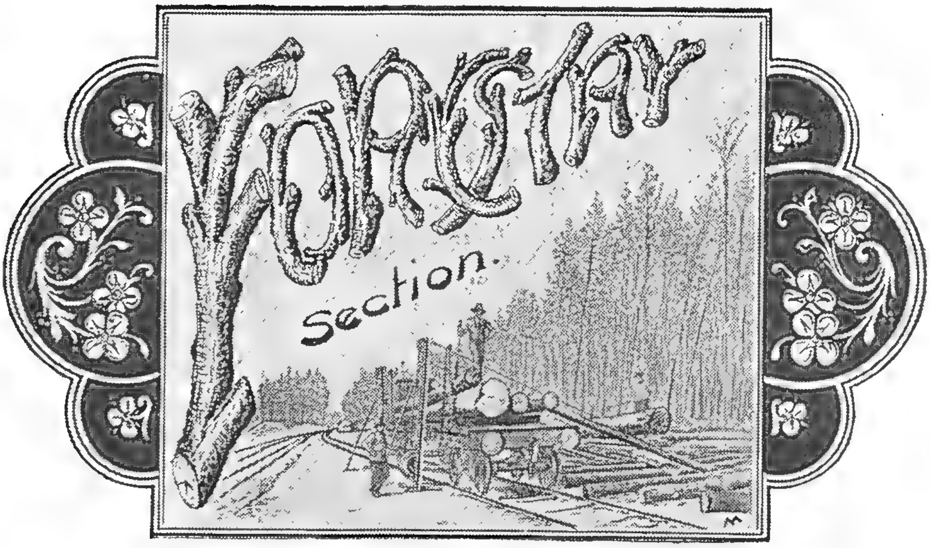
Mr. A. Wadman, in proposing a vote of thanks to the lecturer, said Mr. Hughes was one of the pioneers who introduced molascuit into this country, and he (Mr. Wadman) thought the product would be found a very useful food. He had used it for some time, and was still using it.

Mr. E. Strickland seconded, and the Chairman, in supporting, urged farmers to follow Mr. Hughes's advice and buy molascuit upon analysis showing the quantity of saccharine matter contained in it.

Mr. Hughes, in acknowledging the vote of thanks, quoted figures showing the increase in the use of molascuit. In 1903 only 1,762 tons were exported; last year up to 17th November, 5,445 tons had been sent over from British Guiana alone.

DRILLING BARLEY.

Experiments have been made in Great Britain with the object of ascertaining whether barley should be drilled 6 inches or 12 inches apart, in order to secure a larger yield. These experiments, which were conducted with barley sown after roots on light land, in plots three-eighths of an acre in size, are interesting as indicating the relative value of narrow and wide drills. The quantity of grain sown was 2 bushels of grain to the acre. The plot sown with drills 6 inches apart resulted in a yield of 22 bushels of good grain and 4 st. 4 lb. of tail grain, the weight per bushel being 53 lb. and the weight of straw 19 cwt. 3 qr. Sown 12 inches apart there were 21¾ bushels of good grain, 6 st. 4 lb. of tail grain; the weight per bushel was 54 lb. and the weight of straw 20 cwt. Wide drilling, on the whole, thus shows an advantage.



CONDUCTED BY PHILIP MAC MAHON, Director Botanic Gardens, Brisbane.

THE FOREST.

(A Preliminary Lecture delivered to the students of the Queensland Agricultural College.)

BY PHILIP MAC MAHON.

(Concluded.)

It will be evident that when the leaf canopy has been reduced (and it is a bad plan as a general rule to reduce the leaf canopy too rapidly), two methods of regeneration may be adopted. These are: Natural regeneration and artificial regeneration; and, of course, there may be a combination of these two methods. Thus, the shelter trees may become the mother trees for the ensuing crop. Enough seeds may be produced in one year to stock the area under its altered condition, or the seeds of several years may be required to do it. For forestry purposes trees growing up as the result of one thinning over the area dealt with are regarded as being of one age class, though there may be an actual difference of several years in their ages, due to the fact that they are not all the result of the first year's seeding. When there is sufficient seed produced by the mother trees to continue the succession of timber without any sowing or planting, as is the case in nearly every Australian forest, the system of regeneration is said to be natural.

However, it may happen that the aid of man has to be invoked to scatter seeds or even to plant. In the great Indian forests this has been rarely resorted to, except in a system which obtains in Burma of requiring those natives cultivating rice to plant with their crops certain numbers of teak-trees. The mainstay of the Indian forestry systems has been natural regeneration. But it is always in conjunction with a well thought out system of rotation, on the lines of the system which I have just mentioned, or one which I shall presently mention.

3. *Regeneration under a shelter-wood by groups.*

Under this system compartments are provided for as in the former, but the whole compartment is not taken in hand at once. Groups are selected throughout the compartment as starting points, and the regeneration of a few of these groups undertaken first. It is, in fact, a set of compartments within a compartment. The regeneration of the whole compartment thus extends over

a series of years—say, fifty—and the forest is being attacked simultaneously at several points. This system, while it has advantages in the case of forests combining within the one boundary several groups of well-marked species, is not so simple or so easily worked as No. 2. Regeneration is constantly going on throughout the whole forest, which, if the original plan is adhered to, continues to yield a supply of good timber, and gradually increases in productiveness and value.

4. *Regeneration under a shelter wood by single trees.*

This is a system very largely used in India. It is also known as the shelter-wood selection system. Nothing could well be simpler in theory, and yet to be successfully worked it requires a good deal of skill. In this system the forest is being always thinned out. Single trees or small groups are chosen and removed. A process of selection which aims to—(1) remove matured timber, (2) reduce the leaf canopy sufficiently to encourage the growth of younger timber, (3) to ensure a sufficient amount of shade and protection from sun, wind, and drought.

This system may be classed as a rough-and-ready method, although a very large amount of skill may be introduced into its management. It can, of course, be converted into the compartment system whenever it seems desirable, and it is important to remember that a forest worked on this system may gradually be divided up into a small number of blocks, each of which can be worked separately on the selection system. Where very large areas are dealt with, this is the best method of management. Each block is then cut over or "selected" at regular intervals, which may vary (as Schlich points out) from seven years, as in the beech forests of Buckinghamshire, to thirty years, as in the Burmese teak forests, or forty years, as in the Buxa Sal forest in Bengal.

5. *Coppice forest.*

In many parts of the world there is a large demand for small straight timber, and many trees possess the power to produce such timber as shoots when cut down. In the mining districts of Victoria, where there has been, even at this early stage in the history of the young nation, a dearth of timber, it is found that small trees of several species of eucalyptus, if cut off close to the ground, send up shoots or coppice, which are found to be excellent for mining props, and to command a ready sale. The system as a factor in forestry, apart from the instance here given, is not likely to prove of much importance in Australia for many years to come.

6. *Combination seedling and coppice.*

Generally known as "coppice with standards." This system is coming into great favour in countries where there is a large demand for timber of different sizes. It is more suitable for the wood-lot than for forestry on an extended or national scale. It consists of an over-growth of high forest, and an under-growth of coppice. The standards, as the high trees are called, may themselves be the result of the selection system, and consequently vary as to age, or they may be the result of clear cutting or the compartment system, and may consequently be even-aged. The standards may continue to be thinned out according to an age system, and the coppice should have a shorter rotation. The cutting of the coppice and thinning of the standards take place at the same time, together with the introduction of new seedling standards, to eventually take the place of those thinned out, and so preserve the rotation. The regulation of the canopy to produce any desired density of shade produces variations in the relative growth of the coppice and of the standards, sometimes one being more considered, and sometimes the other, according to the demands of the locality.

7. *High forest with standards.*

This is ordinary high forest, with tall standards scattered at more or less regular intervals over it. It may result either from the compartment or group or selection systems, by leaving standards to increase in size for the production of a certain percentage of very large timber.

8. *Two-storied high forest.*

This consists of a tolerant species, artificially sown or planted under the shade of a semi-mature forest of an intolerant species, the latter being generally thinned over at the same time. It is not of immediate practical application in Australia, but may become important as forestry develops for the purpose of regenerating forests which from any cause are losing the power of natural regeneration. There is a time in the history of every forest when bad management will bring this about, and in the case of many Australian forests the power of reproduction has been, or is nearly, lost. Economic considerations, however, point to the desirability of doing our best to institute a correct system of management in those forests which have not reached this stage, but still retain that vital power which seems in a special way to belong to the forests of this continent.

9. *High forest with soil-protection wood.*

The value of forest as a means of retaining the soil is well known. It happens sometimes that as high forest becomes open, and the soil becomes exposed, it suffers from the effects of sun or from erosion. In such cases, it is desirable to plant or sow a soil-protection underwood, and this should be coppiced from time to time for the obvious purpose of protecting the soil.

10. *Forestry combined with the growing of field crops.*

I have referred to-day to a system which is in vogue in Burma for the establishment of teak plantations. A native Burmese forester was the first to put it into practical operation. The natives of that country were as destructive to the teak plantation forests as the most reckless of ringbarkers. They cut down the forests for the cultivation of rice and cotton. Then the piece of land was abandoned for twenty or thirty years, until it bore a sufficiently large crop of timber to give another good blaze and a dressing of ashes to the land. This was called *taungya* cultivation. The natives were induced by the offer of increased facilities for cultivation and certain regular rewards, to plant teak-trees amongst their crops. These trees have formed very fine plantations, which have proved in every way successful and satisfactory to the Department undertaking the work. This was so long, however, as the system was not extended to unsuitable soil or uncongenial surroundings, which was sometimes the case.

In Europe forestry is sometimes combined with the cultivation of field crops, but this is only admissible where land is very scarce, and even then only in an extremely limited degree.

11. *Forestry combined with the rearing of cattle.*

Every station should have its area of wood supply. The present drought has taught many hitherto unmindful of it the benefit of having a standby of some of the trees suitable for cattle fodder in hard times; trees and bushes of which you will find admirable detailed descriptions in Turner's "Forage Plants of Australia," published by the Department of Agriculture, Sydney, in 1891; or, Maiden's "Useful Plants of Australia," published by the Committee of Management of the Technological Museum of Sydney in 1889.

Of the six principal and six auxiliary systems enumerated by Schlich, it will be seen that those which lend themselves to the present conditions of Australian forests are—

Regeneration under a shelter-wood by (*a*) compartments, (*b*) groups, and (*c*) single trees or selection.

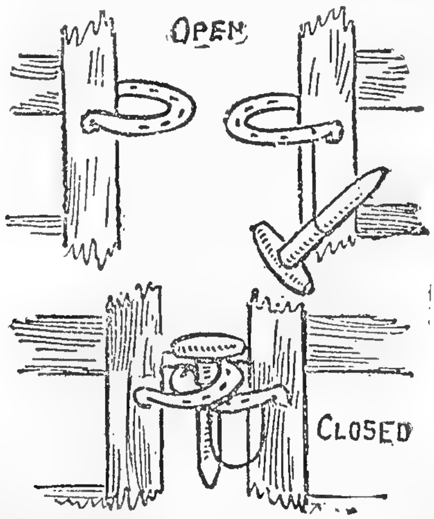
Taking it broadly and generally, the system of natural regeneration, combined with one of these systems, will be found the only really practical factors in restoring such of our forests as are not too far gone to admit of restoration; and, of course, we have immense areas of these, though not by any means the same proportion of forest to plain-land as is found in countries which stand less in need of the ameliorating influences of forests than ours does.

One of the curious and most disastrous features in connection with any attempt at organised forestry which has come under my notice in this country has been the apparent assumption that all trees are alike, and that they have only to be measured according to some standard, and some cast-iron departmental rule devised for dealing with them which will give excellent results all round, both to the timber-getter who is looking for mature timber with the minimum of trouble and expense, to the forester whose duty it is to sell all the mature timber he possibly can, while conserving a sufficient supply of the immature to enable him to carry out his scheme of regeneration, and to the taxpayer whose interest it is that no money should be wasted in mere experimenting on such an immense scale as is involved in forest operations.

Nobody appears ever to have discovered such a rule. The leaders of the Indian Forest Service—Brandis, Schlich, and Ribbentrop—insist on the necessity for close observation of the species you have to deal with, the conditions of your locality, the history of your forest or forests, the nature of your soil, the character of your climate, &c. And when you reflect that these things vary through infinite combinations, like the changes found in shuffling a pack of cards, you will feel inclined to agree with me that a rule which decides, for instance, that an ironbark is only mature when it reaches dimensions which ironbarks in some localities would not attain in ten thousand years, is like the rule laid own by Procrustes, who made the traveller fit his bed by taking a length off him if he were too long, and stretching him with a windlass if too short.

A SIMPLE GATE FASTENER.

On farm premises there are generally a number of old horse shoes lying about. These are invariably discarded as useless, but to a person of an adaptive turn of mind they can be applied with advantage in several ways about the premises. For instance, gates are only too often lacking the means of



fastening. What easier than to take a pair of old shoes, fasten one on the gate and the other on the post, so that one will close over the other, and, with an old spade or other handle, secure the two as shown in our illustration, a cord being attached to the peg to prevent its being lost or unplaced.—*Farmer and Stockbreeder.*

Science.

POISONOUS GLUCOSIDE IN SWEET POTATO VINES *(BATATA EDULIS)*.

By J. C. BRÜNNICH, F.C.S., Chemist to the Department of Agriculture and Stock.

During the months of February and March, in several piggeries at various places in this State, a very serious mortality amongst swine has been reported.

The history of the cases is similar right through, and a few of these cases will serve as examples:—

1. Farmer M——, of G——, reports that 9 pigs out of 11 died within an hour after feeding on a mixture of sweet potato vines and skimmed milk. The symptoms appeared to him like the action of a poison.

Analysis of the contents of the stomach by the Government Analyst gave negative results.

2. Farmer R——, of E—— P——, reports having lost 18 pigs. The food consisted of boiled pumpkins, melons, and sweet potato vines. The pigs appeared quite well up to eating this food, but within half an hour after feeding they lay down, struggled a little, and were dead within five minutes. Only two pigs recovered after an attack.

A sample of the boiled mixed food was submitted for analysis to the Government Analyst, who reported distinct traces of prussic acid.

3. Farmer C—— H—— lost 12 pigs out of 27. Within an hour of being fed, all were taken ill with vomiting and showing signs of pains. A few of the pigs recovered, but seemed sleepy for some time afterwards.

Samples of the food, vomit, and contents of the stomach were submitted to analysis, but the Government Analyst reports that no poison could be found in any of the three bottles.

Several other cases were reported and investigated by the Government Analyst, and in two cases only were traces of prussic acid found. As part of the food common to all cases consisted of sweet potato vines, the Government Analyst, in his report to this Department, suggests the possibility of a poisonous glucoside in these vines being the cause of the mortality.

The importance of a closer investigation becoming apparent, samples of three different varieties of the sweet potato vine were ordered and obtained from the farm of the Agricultural College at Gatton. The analyses of these samples, carried out at the laboratory of this Department, proved conclusively the presence of a glucoside, which, on standing for a short time, yields hydrocyanic acid (prussic acid), similar to the poisonous principle found in cassava roots and in the stalks of immature green sorghum.

The following is the result of the analyses:—

		Hydrocyanic Acid. Percentage of Green Substance.
I. *White Maltese*—		
Moisture	87.4 per cent.	.0139
	or .973 grains per lb. of green substance	
II. *Rosella*—		
Moisture	86.9 per cent.	.0159
	or 1.113 grains per lb. of green substance	
III. *Spanish Giant*—		
Moisture	87.0 per cent.	.0187
	or 1.323 grains per lb. of green substance	

These analyses show that the vines yield as much as one grain of prussic acid per pound of the green feed, which quantity accounts easily for the sudden death of animals feeding on larger quantities of such food. I herewith give

the report and opinion expressed by Government Veterinary Surgeon A. H. Cory, M.R.C.V.S., on the subject:—

"From correspondence received from the owners of the pigs I noticed that all remarked upon the suddenness of the disease; the absence upon *post mortem* examination of pathological lesions of any specific disease; also, that previous to receiving the last feed the pigs appeared in their usual health. These facts caused suspicion to fall on the food which had been fed to the animals, consequently this was analysed and found to contain hydrocyanic acid.

"The action of poisons varies considerably in different animals of the same species. For instance, animals that are in a weak state absorb poisons much more rapidly than when in a strong healthy condition. Weight and age also have their influence, as also the condition of the stomach and intestines, whether they are full or empty, and the nature of their contents. Thus it is practically impossible to state definitely the minimum fatal dose of any poison.

"Of the medicinal hydrocyanic acid (containing 2 per cent. of anhydrous acid) 2 to 7 minims or drops is a full dose for a pig. It is one of the most deadly poisons known. Almost as soon as it reaches the gastro-intestinal tract it is absorbed into the general circulation, when the central nervous system becomes paralysed. If sufficient acid is taken by the animal, death generally follows in a few minutes, but if the poisoning is not immediate the symptoms shown are generally as follows:—Giddiness, staggering movements, a few short inspirations followed by rapid expirations and irregular heart action. These are followed by convulsions due to paralysis of the brain and spinal cord, then coma sets in and paralysis of the muscles of the body; the action of the heart and lungs become very weak, and death ensues from paralysis of the heart and respiratory centres.

"*Post mortem* appearances may vary considerably. When due to a large dose of the poison, and the animal has died quickly owing to paralysis of the heart centre, the blood is of a bright colour; but when death has been somewhat retarded owing to the respiratory centre being paralysed, the appearances are those of suffocation. For some hours after death the blood remains fluid, of a bluish colour, and may evolve the peculiar odour of the acid.

"*Antidotes.*—Prussic acid generally causes death before any antidote can be given, but, when possible, artificial respiration should be tried (moving the fore legs backwards and forwards at the same time, causing pressure on the chest walls), cold and warm water applied alternately to the head and neck, and inhalations of ammonia."

From these remarks, it is easily understood that the symptoms of the cases clearly agree with hydrocyanic poisoning, and that the source of the poison is found in the sweet potato vine. It is not at all unlikely that the quantity of the poison contained in the vines will alter with the season, making it quite probable that at other times the vines might be fed with less danger; but only a very careful and lengthy investigation will decide this matter.

In the meantime, our farmers are cautioned to be careful in the use of sweet potato vines as a pig or cattle food at this season of the year, and to be particular not to feed it in too large quantities.

Boiling the feed, and taking care to pour off the first water in which the vines were boiled, would considerably lessen the danger.

ADDENDUM.

The Vegetable Pathologist—H. Tryon—it may be noted, has directed the attention of the writer to the discovery of a cyanogen-yielding plant in the natural order *Convolvuluceœ* (in which the sweet potato, *Ipomœa batatas*, Poiret, is included), by Van Romburgh already, some years since, and that Greshoff, in more particularly alluding to it, states that this plant was the *Ipomœa sinuata*, Orteg (*I. dissecta*, Pursh.) of the West Indies, and that investigator mentioned obtained from it by distillation, hydrocyanic acid and benzaldehyde. [*Greshoff M.* Beschrijving der giftige en bedelmende planten bij de vischvangst in gebruik. II. p. 113, 1900.]

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Chemist to the Department of Agriculture.

A good many readers of this *Journal* have repeatedly expressed the wish that I should, in easy lessons and in simple language, explain to them the most important principles of Agricultural Chemistry. Furthermore, as in our State schools "*Nature Knowledge*" has taken the prominent place it so justly deserves, several teachers have asked me to prepare a course on agricultural chemistry, on similar lines as the lectures I delivered some time back to the East Moreton Teachers' Association, which would enable the teachers to give easy lessons, illustrated by simple experiments, to their pupils.

The task before me is not an easy one. The chief difficulty lies in deciding how far to go in order to make the lessons generally useful, instructive, and interesting, without wearying the average reader. In order to avoid the latter, I have decided to give a complete description of the experiments illustrating the lectures, and also fuller definition and explanation of scientific terms at the end of each lesson. In the first lesson, however, which deals with the general principles and fundamental laws of chemistry, a certain amount of technicalities could not be avoided.

For the special benefit of the reader who should wish to enter deeper into the study of agricultural chemistry, I give at the end of this lesson a list of a few of the most popular text-books, with date of latest edition and publisher's price.

FIRST LESSON.

GENERAL OBJECTS OF CHEMISTRY, PRINCIPAL LAWS, EXPLANATION OF A FEW IMPORTANT TERMS, CHEMICAL ELEMENTS.

Chemistry, one of the natural sciences, is the study of certain changes which matter may undergo, and **agricultural chemistry** deals more particularly with changes taking place in the soil, and during growth and life of plants and animals.

All **matter** *(substances)* found in **Nature** is liable to changes, either *temporary* or *permanent,* which changes may generally be perceived by one of our senses. We can feel the action of heat or fire on our hand or on a piece of iron thrust into the fire; we can see the flame produced by a burning piece of wood, and hear a peculiar crackling noise when wood burns. We can smell the difference when burning wood or hair. We can, by taste, distinguish powdered sugar from salt, which to the eye appear nearly alike.

Experiment 1.—When we heat a small piece of *sulphur* in a test-tube, we see that the substance will melt, producing a clear yellow liquid, which on further heating becomes almost black and very viscous, at a still higher temperature becoming again more liquid; the liquid finally begins to boil, forming reddish-brown vapours, which in the cooler parts of the tube deposit again a fine yellow powder. Continuing the heating, the sulphur vapours will at last begin to burn with a blue flame, producing at the same time the well-known suffocating smell of *sulphurous acid.*

The changes taking place in the first part of the experiment are simply physical changes, the sulphur remaining sulphur; the changes are, furthermore, only temporary, because, when cooling, the sulphur will again be produced in its original form. The change in the last part, however, is a permanent chemical change, as from the sulphur, with the help of the oxygen in the air, a new substance—a *chemical compound, sulphurous acid*—has been formed.

Experiment 2.—If we take a small piece of *rock lime*, or "*quick lime*," and moisten it with water, we perceive that under formation of heat the lime breaks up and forms a fine white powder—"*slaked lime.*" On adding more water, we obtain a pasty, milky liquid—"*milk of lime.*" Putting this milk of lime in a larger bottle and filling up with water we find that apparently, none of the lime dissolves, as it soon settles down, after shaking up, in the form of a white sediment. But if we taste the clear liquid we find it has the peculiar taste of "*lime-water*," showing that some of the lime has become dissolved in the water. We find in this experiment a chemical change of such activity that a considerable amount of heat is produced.

Experiment 3.—When burning a candle in a closed bottle, we soon notice the flame becoming smaller and smaller, and finally going out altogether. No apparent change has taken place in the bottle, but, by adding a small quantity of the clear lime-water produced in Experiment 2 and shaking it, we notice a distinct milkiness in the lime-water.

Experiment 4.—By blowing or breathing into a bottle containing clear lime-water, we can produce a similar milkiness.

From Experiments 3 and 4, we learn that a change takes place in the air by the burning of a candle, or by being inhaled into our lungs and exhaled again, which change becomes apparent by forming a milkiness in lime-water. This milkiness is due to the formation of *carbonate of lime* by the action of carbonic acid, produced in the burning of the candle, and also by the air passing through the lungs, on the small quantity of lime dissolved in the lime-water.

A chemical change may result in the production of a new substance or compound from the addition of two or more substances, in which case we call it a **chemical combination**; or, again, the change may result in the separation of one substance into two or more substances of a different kind, in which case we speak of a **chemical decomposition.**

In studying the composition of substances, the chemist finds that they may all be divided into two classes—

1. **Elements,** substances which cannot be decomposed by any power or force known to us; and
2. **Compounds,** substances which may be decomposed, and which are composed of two or more elements.

When subdividing matter or substance with the help of physical forces, we reach finally a certain state of fineness in which the particles cannot be further divided. Such small particles are called **molecules.**

Molecules, however, may be further divided by certain other forces into smaller particles of elementary substances, which could not exist in a free state, but would always recombine as soon as formed. Such particles are called **atoms.**

In the case of an element—for instance, sulphur—we would find that the molecules consist of atoms of the same kind, and we call such molecules ELEMENTARY MOLECULES. In sulphurous acid, a product of combination formed by the burning of sulphur in air, we would find the molecules to consist of atoms of oxygen and an atom of sulphur. Such molecules are COMPOUND MOLECULES.

The ancient philosophers spoke only of four elementary substances—"EARTH, WATER, AIR, AND FIRE"—which we know are really no elements at all. Still, the compounds forming the former three, and the forces—light and heat—produced by fire, are indispensable to plant and animal life, and form the most important part in the study of agricultural chemistry.

At the present time about seventy elementary substances are known to the chemists, which, in accordance with certain physical properties, are divided into two classes—**metals** and **non-metals.** Only a limited number of these elements take part in the chemical changes occurring during plant and animal life, and really only fifteen or sixteen are absolutely indispensable for the maintenance of such life.

Chemists adopted certain **symbols** to denote the atoms of the various elements, using, generally, the initial letter of the ordinary name, in some cases of the Latin name of the element. In the case of elements having the same initials, a second characteristic letter of the name is added.

The elements of *greatest importance* to the *agriculturist* are the following, with their chemical symbols added:—

Non-metallic.		*Metallic.*
Hydrogen, H.	Sulphur, S.	Potassium, K.
Oxygen, O.	Phosphorus, P.	Sodium, Na.
Nitrogen, N.	Silicon, Si.	Calcium, Ca.
Carbon, C.		Magnesium, Mg.
Chlorine, Cl.		Manganese, Mn.
Bromine, Br.		Iron, Fe.
Iodine, I.		Aluminium, Al.

A few other elements of importance are—

Silver, Ag.; gold, Au.; mercury, Hg.; copper, Cu.; lead, Pb.; zinc, Zn.; tin, Sn.; arsenic, As.

In studying the composition of chemical compounds, the chemist soon learned that in every compound the elements were combined in certain proportion, and that, for instance, water, whencesoever obtained, contains 16 parts by weight of oxygen and 2 parts of hydrogen. These constant weights were compared with the weight of hydrogen, which is the lightest of all substances, the weight of its atom being taken as one, or $H = 1$. The **atomic weight** of oxygen was found to be 16, sulphur 32, iron 56, &c.

Experiment 5.—Mixing intimately *iron filings* and powdered *sulphur* in proportion of their atomic weights, taking 56 parts of iron to 32 parts of sulphur, and putting the mixture into a test-tube and heating slightly, we find that the mass continues to glow, and a new compound—*iron sulphide*—is formed, which is totally different in its appearance and properties from the elements from which it was formed.

If we would take a much larger quantity of iron filings, we would find that only part of the filings would enter into composition with the sulphur, the rest remaining unaltered.

Such chemical processes are simply and conveniently expressed, with the aid of the chemical symbols, as a **chemical formula.** We show the formation of iron sulphide by the formula—

$$Fe + S = FeS.$$

Again, the formation of sulphurous acid from sulphur—

$$S + O_2 = SO_2,$$

showing that one atom of sulphur combines with two atoms of oxygen, forming one molecule of sulphurous acid.

APPENDIX TO FIRST LESSON.

NATURE, in the abstract, is the aggregate of the powers and properties of all things. Nature means the sum of all phenomena, together with the causes which produce them.—J. S. Mill.

MATTER is a sensible substance, which can be moved, broken up, and otherwise modified, but not destroyed or produced.

MOLECULES are the smallest particles of matter which could be obtained by physical methods of subdivision.

ATOMS are the smallest particles of an element which can exist in combination with other atoms in a molecule.

METALLIC ELEMENTS, good conductors for heat and electricity, have a metallic lustre, and form, with oxygen, compounds which have an alkaline taste and reaction called BASES.

NON-METALLIC ELEMENTS are bad conductors of heat and electricity, possess no or only slight metallic lustre, and form oxygen compounds having an *acid* taste and reaction, called ACIDS.

CHEMICAL SYMBOLS.—The sign K for potassium is derived from kalium, Na for sodium from natrium, Fe for iron from ferrum, &c.

The symbols must not be regarded simply as shortened signs of the names of the elements, but they denote always an atom of the element. In order to indicate more than one atom, small numerals are placed immediately after the symbol; so O_2, H_2 denote 2 atoms of oxygen and hydrogen.

H_2O denotes a molecule of water, consisting of 2 atoms of hydrogen and 1 atom of oxygen.

In order to indicate more than one molecule, we place a numeral in front of the formula. $5H_2O$ thus indicates 5 molecules of water.

ATOMIC WEIGHT of an element is the number which shows how many times heavier the smallest mass of that element which can take part in a chemical change is than the smallest particle of hydrogen.

Experiment 1.—Required, one test-tube and small piece of sulphur and spirit lamp. Fully explained in text.

Experiment 2.—Required, piece of rock lime. Lime-water prepared is stored in bottle for other experiments.

Experiment 3.—The best way to burn the candle is to use a lightning jar (Fig. 1A) or any other wide-mouthed pickle bottle. It is best to have the candle attached to a piece of wire, so that it can be quickly removed, when it has ceased to burn, before the lime-water is added and shaken up in the bottle.

Experiment 4.—The lime-water can be put into an ordinary glass tumbler, and the air blown through it with the help of a short piece of glass tube (Fig. 1C), but the experiment is very much more striking if arranged, as shown in Fig. 1B,

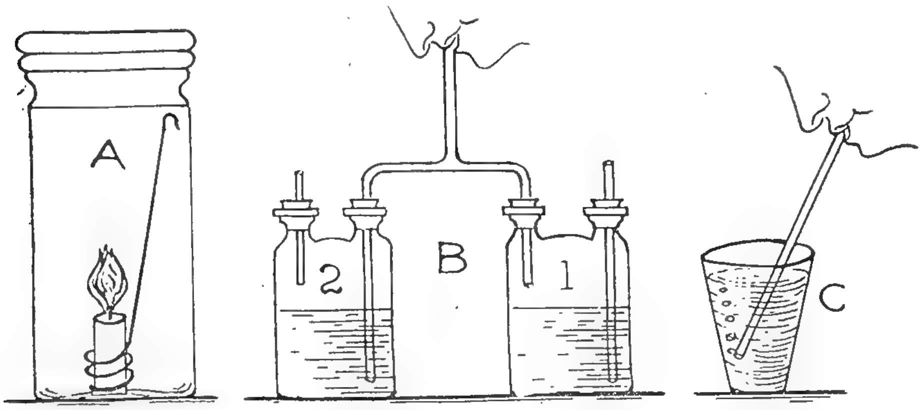


Fig 1.

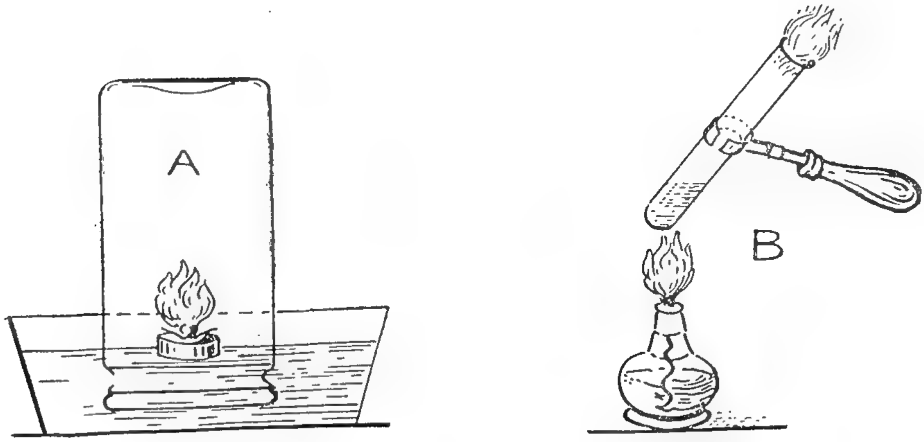


Fig 2.

with the help of two two-necked Wolfe's bottles, some glass tubing, and a glass T-piece. In this way the air is both inhaled and exhaled through the same tube—the lime-water in Bottle 1, through which air enters, remains clear; and the lime-water in Bottle 2 gets milky.

Experiment 5.—Iron filings and sulphur flour. The students may be shown that in the mixture a magnet would separate out the iron filings from the sulphur; whereas after igniting the mixture in the test-tube and powdering the cooled compound, the magnet will not be able to make any separation.

TEXT-BOOKS.

Johnston's Catechism of Agricultural Chemistry, by Sir Chas. Cameron and Aikman, 1892, price 1s.

Johnston's Elements of Agricultural Chemistry, same authors, 1894, price 6s. 6d.

Chemistry of the Farm, by Prof. Warington, 1902, price 2s. 6d.

The larger and latest work—

Manual of Agricultural Chemistry, by Prof. Ingle, 1902, price 7s. 6d.

For practical work—

Laboratory Guide, by Prof. Church, 1894, price 5s. 6d

Questions to First Lesson.

1. What is agricultural chemistry?
2. Explain the difference between physical and chemical changes.
3. What is the difference between a compound and an element?
4. What are molecules and atoms?
5. Explain what changes take place when sulphur is heated.
6. What are the characteristics of metallic and non-metallic elements?
7. Which is the lightest of all elements?
8. Explain the term "atomic weight."
9. What is a chemical symbol?
10. In which manner are the symbols used to express chemical changes?
11. How is sulphur of iron prepared, and how can you prove that it is not a mixture, but a chemical compound?
12. Why does a candle cease to burn in a closed vessel?
13. How can you demonstrate the formation of carbonic acid during combustion?
14. Describe the changes taking place when water is added to quicklime.
15. Name the elements of greatest importance to farmers.

SECOND LESSON.

THE ATMOSPHERE, OXYGEN AND OXIDATION, RESPIRATION, NITROGEN, NITRIFICATION.

The **atmospheric air** plays a very important part in the life of plants and animals, and a knowledge of its composition and properties is absolutely necessary to understand many chemical changes. The atmosphere exerts a considerable pressure, which amounts to 14¾ lb. per square inch at the sea-level. This pressure indicates the weight of the air, and the total weight of air upon an acre of ground amounts to about 41,000 tons. The pressure of air varies from day to day, and during the day, and is measured with the aid of a barometer. An important property of the air is the fact that dry air allows the heat rays coming from the sun to pass through without being much warmed. Presence of water vapour, still more so of clouds, will cause the air to absorb much more heat. This accounts for our cold, clear, moonlight nights, when the heat absorbed by the earth during the day time is freely given off during the night, and lost in space. The presence of clouds will check such loss of heat; and cloudy nights are, therefore, much warmer. Artificial clouds or haze, produced by the aid of smoky fires, will often prevent heavy damage to crops by frost during clear winter nights.

Air is a mixture (not a compound) of 4 parts of NITROGEN with 1 part of OXYGEN and small amounts of other gases, as CARBONIC ACID GAS or CARBON DIOXIDE, AMMONIA, OXIDES OF NITROGEN, WATER VAPOURS, OZONE, etc.

The composition of the air varies very slightly in the different places of the globe.

In large cities and in marshy places the amount of oxygen is very slightly lower.

WATER.—*Rain, river, and sea water* always contain some air in solution, such air, being much richer in oxygen, as this element is more soluble in water than nitrogen. Running water and the water of the ocean contain more oxygen and less carbonic acid than stagnant water.

The soil, particularly the surface soil, always contains air, which is of importance to plant life. The air in the soil is always richer in carbonic acid gas and poorer in oxygen than atmospheric air. Air is an important factor in the formation of the soil. Surface soil must be kept loose to allow the air to enter the soil; swampy soil must be drained for the same reason. Air is necessary to the germination of the seeds, and failure is often due to putting the seeds too deep into the soil. Seeds kept in airtight bottles will soon lose their germinating power. Air always contains small amounts of *suspended solid matters*, as dust, coal dust, salt, and a large amount of micro-organisms and their spores. We have already learned by one of the experiments of the first lesson that air supports combustion. A candle burns in air. If we could withdraw all the air from the bottle with the help of an air pump, we would learn that the candle could not burn. During this combustion, part of the oxygen is consumed.

Experiment 6.—The third experiment is repeated, taking care that the bottle is tightly closed. When the candle has ceased to burn, the stopper or the cover of the bottle is removed under water, and water will enter the bottle, showing that part of the air has been consumed. This experiment can also be shown by using a bell jar standing in a basin of water, and having the candle floating on the water, by attaching it to a piece of cork. Although the candle ceases to burn, all the oxygen is by no means consumed, but this air still contains $18\frac{1}{2}$ parts per 100 of oxygen and $2\frac{1}{2}$ parts of carbonic acid gas. In such air a human being could exist for only a few minutes, and this property is made use of in testing the air of wells or cellars with a lighted candle before entering. If the candle burns brightly, the air is fit for breathing. Air issuing from the lungs is much richer in carbonic acid gas, containing from $3\frac{1}{2}$ to 4 parts per 100 of this gas, and is quite unfit to be used again for breathing; for this reason good ventilation in crowded rooms has to be provided for.

Oxygen is the most important constituent of the atmosphere, and is also by far the most abundant of all the elements forming the crust of our globe. We find oxygen in combination with hydrogen in water, with hydrogen and carbon in all organic substances of which plants and animals are built up, and in connection with metals and non-metallic elements in the different minerals and ores forming the rocks of the earth. About one-half by weight of the solid earth, as far as known to us, including water and the atmosphere, is oxygen.

Oxygen is easily prepared by heating red mercuric oxide (Experiment 7) or potassium chlorate (Experiment 8). Oxygen is a colourless gas, having no smell or taste, which supports combustion. A glowing piece of wood will burst into flame when brought into a stream of oxygen. Sulphur, charcoal, and phosphorus burn in pure oxygen with much greater brilliancy and violence.

Oxidation.— The act of combination of various substances with oxygen is called oxidation. This process is of vital importance. The respiration or breathing of animals, the decay and putrefaction of animal and vegetable matter, the fermentation of hay and ensilage, the rusting of iron, drying of oil-paints, the production of vinegar from alcoholic liquids, are all examples of oxidation. In all processes of oxidation, heat is generated, although in some cases of very slow oxidation this production of heat may not become apparent to us. A very rapid oxidation is frequently accompanied by a great increase

of temperature sufficient to make particles luminous, in which case we speak of **combustion.**

The products of oxidation are compounds of other elements with oxygen, which are called **oxides.** In many cases, elements combine with oxygen in more than one proportion. We have, for instance—

Sulphur dioxide, SO_2, giving, with water, sulphurous acid.
Sulphur trioxide, SO_3, giving, with water, sulphuric acid.
Iron monoxide, FeO, or ferrous oxide.
Iron sesquioxide, Fe_2O_3, or ferric oxide.
Black oxide of iron or magnetic oxide, Fe_3O_4, or ferrous-ferric oxide.

In accordance with their chemical properties, we divide the oxides into two classes—

1. **Basic oxides,** which, by combination with water, form **hydrates** or **hydroxides,** for instance, caustic lime or calcium oxide forms with water slaked lime or calcium hydroxide—

$$CaO + H_2O = CaO_2H_2.$$

2. **Anhydrides,** oxides of the non-metallic elements which, with water, form **acids.**

Sulphur trioxide with water forms sulphuric acid (old name, oil of vitriol)—

$$SO_3 + H_2O = H_2SO_4, \text{ sulphuric acid.}$$

Basic oxides and anhydrides, and again hydroxides and acids, are able to form together new compounds, which are called **salts.**

We are able to distinguish between bases or basic oxides and acids by our taste. A test used by the chemist is *litmus paper* or *litmus solution,* which is coloured blue by the bases and red by the acids (Experiment 9). As soon as we add an acid to the base and thus form a salt, we reach a point when the paper retains a peculiar purple colour, which indicates a neutral reaction, when neither free acid nor free base is present in the solution.

During any process of oxidation or combustion *no destruction of matter* takes place; although when burning a piece of wood the wood apparently disappears, leaving only a small heap of ashes, nothing is lost but the gases produced—viz., carbonic acid gas and water vapour—which together will weigh exactly the same amount as the wood burnt, with the addition of the oxygen taken from the air necessary for complete oxidation.

WOOD or CELLULOSE is an organic compound containing carbon, hydrogen, and water in the proportion as expressed by the formula $C_6H_{10}O_5$. During combustion, 6 molecules of oxygen are necessary, viz.:—

$$C_6H_{10}O_5 + 6O_2 = 6CO_2 + 5H_2O,$$

obtaining 6 molecules of carbonic acid and 5 molecules of water.

Respiration of all living beings is a process of oxidation. By the respiration, air is brought into close contact with the blood flowing through the lungs. The blood loses the carbonic acid gas which it accumulated during its passage through the tissues of the body, and takes up a fresh supply of oxygen. This oxygen is necessary for the slow oxidation of the combustible portion of the food consumed and of the waste materials; and this slow oxidation, by the consequent small amounts of heat produced, maintains the body at a uniform temperature.

A similar process of respiration is continually, but very slowly, going on in plant life, quite distinct from the process of *assimilation* by which plants take up the carbonic acid in the air and utilise it in the building up of new material.

Nitrogen.—As we have already learned, nitrogen forms about four-fifths of our atmosphere. It is a colourless gas, without smell or taste. Nitrogen will neither burn nor support combustion. It is one of the most inert

elementary substances, as it will only combine directly with very few elements. In the atmosphere its presence must be simply considered for the purpose of diluting the oxygen and preventing too violent combustions. At very high temperatures, under the influence of the electric spark, nitrogen unites with oxygen in small quantities. The presence of the small but still very important quantities of combined nitrogen in the air is due to such combination taking place under the influence of lightning discharges. Being itself an inert substance, having little affinity for other elements, many of its compounds are easily and violently decomposed, as gun-cotton and dynamite. In combination with hydrogen, nitrogen forms the important compound AMMONIA, which is also found in small quantities in the air.

Nitrogen combined with carbon, oxygen, and hydrogen is found in many of the organic substances in plants and animals. Particularly rich in nitrogen, containing about 47 per cent., is UREA OR CARBAMIDE, $CON_2H_4 = CO(NH_2)_2$ or $= CO \begin{array}{l}-NH_2\\-NH_2\end{array}$ a substance in the form of which the waste nitrogen of the animal body is excreted, and which, for its richness in nitrogen, has a great manurial value.

Oxides of Nitrogen.—Five different oxides of nitrogen exist, three of which form acids, but of these only *Nitrous acid*, HNO_2, and *Nitric acid*, HNO_3, are of importance to the farmer.

Nitrous Acid is formed in minute quantities in the form of its salts, called *nitrites*, in the atmosphere, in rain water, in soil, and also in the sap of a few plants.

Nitric Acid is also found in small quantities in the air in the form of ammonium nitrate, in rain water, and in soil. Considerable deposits of potassium nitrate (saltpetre), KNO_3, and of sodium nitrate (Chili saltpetre), $NaNO_3$, are found in certain tropical localities—India, Chili, and Peru. Well water and drainage waters frequently contain nitrates, as the soil is not able to absorb or bind the nitrates. Ammonia and other salts are easily retained or absorbed by soil.

Nitric acid is easily obtained by the heating of saltpetre with sulphuric acid (Experiment 10), strongly acid fumes of the acid being given off. It is a yellowish liquid—a powerful acid—which attacks and dissolves nearly all metals, with the exception of gold, platinum, and aluminium.

Nitric acid containing such a large amount of oxygen has a powerful oxidising action on many substances.

By boiling strong nitric acid in a test-tube, the mouth of which is loosely closed with a plug of horse hair or raw silk (Experiment 11), the latter may be made to burn brilliantly in the vapours of the acid. Powdered charcoal and sawdust take fire when brought into contact with the strong acid.

Skin and silk are stained yellow (Experiment 12). The blue colour of serge is changed into yellow (Experiment 13). A weak indigo solution is discoloured by a few drops of nitric acid (Experiment 14).

By mixing a solution of ferrous sulphate (green vitriol) with a solution containing nitrates in a test-tube, and adding sulphuric acid—adding it cautiously, so that it does not mix with the liquid but collects at the bottom—we notice, after a while, the formation of a dark-brown ring between the two liquids (Experiment 15). This and the previous experiment are **analytical tests** for the presence of nitric acid. The substances added to test another substance are called **reagents**; the process taking place is called a **reaction.**

In Nature the production of nitric acid and its salts (nitrates) must be due to the oxidation of ammonia and other nitrogenous substances. During the slow decomposition of organic substances containing nitrogen—as stable manure, urine, green manures, blood, and also the nitrogenous matters in the soil—in the first place *ammonia* and *ammonia compounds* will be formed, which under influence of certain micro-organisms, are changed, by a process of oxidation, first into nitrites, and by further oxidation into nitrates. This process

is called **nitrification**, and can only take place under favourable conditions, some of which are—presence of basic materials (lime), suitable temperature, moisture, presence of sufficient oxygen, &c. This important process will be studied more fully in a later lesson dealing with the reactions occurring in soil.

In our next lesson, the chemistry of air will be concluded by the study of carbonic acid and the process of assimilation taking place in plant life.

APPENDIX TO SECOND LESSON.

Experiment 6.—This experiment is much improved by burning a small piece of phosphorus floating on a piece of cork under the jar, all the oxygen is consumed, and the jar will be filled one-fifth with water (Fig. 2A).

Experiment 7.—Heating mercury oxide in a test-tube. The red oxide changes its colour, turning black (resuming its red colour again on cooling, this being only a physical change), and, on further heating, oxygen is given off, which can be shown with a glowing splinter of wood. Metallic mercury remains in the tube. $HgO = Hg + O$.

Experiment 8.—Potassium chlorate is similarly heated in a test-tube. If oxygen is to be made on a larger scale, it is better to add to the chlorate one-fifth of its weight of powdered black oxide of manganese, when the oxygen is given off at a lower temperature, without any decomposition of the manganese itself. The potassium chlorate splits up into potassium chloride and free oxygen. $KClO_3 = KCl + O_3$. The gas may be collected in jars filled with water and standing in another dish (like Fig. 2A). The oxygen is led with a glass tube under the jar, and replaces the water. The brilliant combustion of sulphur, phosphorus, charcoal, and fine iron wire may be shown.

Experiment 9.—Some litmus solution and litmus paper are required, and the action of lime-water and an acid in changing the colour may be shown.

Experiment 10.—Saltpetre is heated in a test-tube with an equal weight of strong sulphuric acid, when the following reaction takes place:—

$$\underset{\text{Potassium nitrate.}}{KNO_3} + \underset{\text{Sulphuric acid.}}{H_2SO_4} = \underset{\text{Nitric acid.}}{HNO_3} + \underset{\text{Acid potassium sulphate.}}{KHSO_4}$$

The formation of an acid salt of sulphuric acid is to be noted. Theoretically, only half the quantity of sulphuric acid should suffice, according to the formula—

$$2KNO_3 + H_2SO_4 = 2HNO_3 + \underset{\text{Potassium sulphate.}}{K_2SO_4}$$

for the formation of potassium sulphate, but too high a temperature is required, which also decomposes a large amount of the nitric acid formed. Show the presence of acid by litmus paper.

Experiment 11.—Boil a little strong nitric acid in a test-tube, the mouth of which is loosely plugged up with a little raw silk or horse hair (Fig. 2B); the latter will burn brilliantly on lighting.

Experiment 12.—Show the action of nitric acid on the skin, on wool and silk, which all will be stained yellow.

Experiment 13.—Drop a little nitric acid on a piece of navy blue serge, which colour is changed into a yellow or orange-red, which cannot be brought back again on neutralising with ammonia, like the discolouration produced by other acids.

Experiment 14.—A weak indigo solution in a test-tube is treated with a few drops of nitric acid.

Experiment 15 is fully explained. The dark colour is due to the formation of nitric oxide, which dissolves in the iron sulphate solution.

SALT is a compound formed when the hydrogen of an acid is entirely or partly replaced by a metal. Calcium oxide and carbonic acid form calcium carbonate (a process which will always go on where rock lime is exposed to the atmosphere).

$$CaO + CO_2 = CaCO_3,$$

or calcium hydroxide and carbonic acid, form again lime carbonate—

$$CaO_2H_2 + CO_2 = H_2O + CaCO_3.$$

By addition of sulphuric acid to lime we form calcium sulphate or gypsum—

$$CaO + H_2SO_4 = H_2O + CaSO_4.$$

The formation of acid potassium sulphate in Experiment 10 is an instance in which only part of the hydrogen is replaced by a metal.

OXIDES OF NITROGEN.—The following five oxides exist:—

NITROUS OXIDE (Laughing gas)	N_2O, forming HYPONITROUS ACID, HNO
Nitric oxide	NO
NITROGEN TRIOXIDE	N_2O_3, forming NITROUS ACID, HNO_2
Nitrogen peroxide	NO_2 and N_2O_4
NITROGEN PENTOXIDE	N_2O_5, forming NITRIC ACID, HNO_3

Questions to Second Lesson.

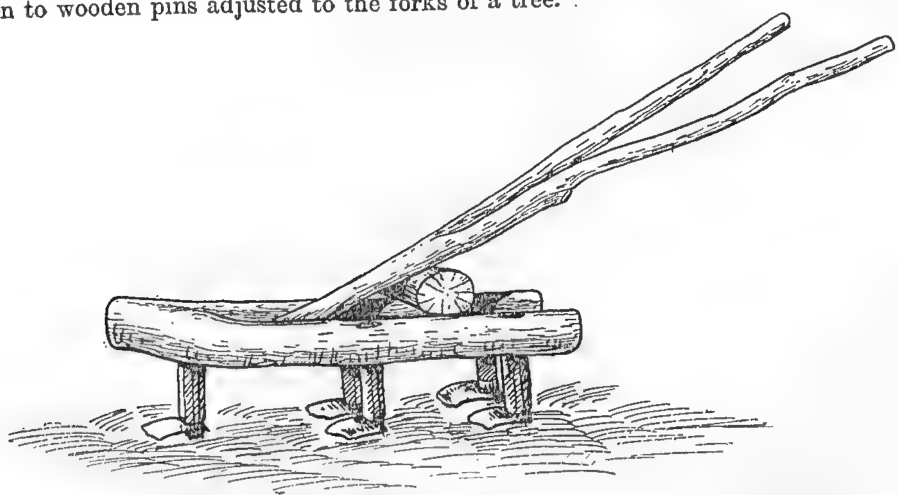
1. What is the composition of the atmospheric air?
2. Is air a chemical compound?
3. Do water and soil contain air?
4. Why must seeds not be planted too deep?
5. Why are clear cloudless nights colder than cloudy nights?
6. What means has a farmer to protect his crops against damage by frost during cold nights?
7. What is oxygen, and how is it prepared?
8. Give examples of the chemical process of oxidation.
9. What is a combustion?
10. What is wood, and what is it changed to when burnt?
11. What is respiration, and what is its object?
12. What is the difference between basic and acid oxides?
13. What is a salt?
14. What is nitrogen?
15. In what combination is nitrogen found in plant and animal life?
16. Which are the most important nitrates, and where are they found?
17. Why are nitrates found in drainage water?
18. What is nitrification, and what conditions are favourable to this process?
19. What nitrogen compounds are found in the air?
20. What are the properties of nitric acid?

A HOME-MADE PLANET JUNIOR.

"Where there is a will there is a way."

R. S. NEVILL.

The accompanying cut shows a novel Planet Junior, invented by Mr. Alexander Bell, of Bebo, near Texas. It is made from worn-out hoes, fastened on to wooden pins adjusted to the forks of a tree.



Mr. Bell, being in need of a cultivator for his tobacco, conceived this idea of utilising his worn-out hoes, and it serves the purpose admirably, putting the soil in the best of tilth.

It can also be used as a scraper for cleaning out weeds, when properly adjusted.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1904.									1905.			
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
North.													
Bowen	0·31	0·25	0·30	Nil	Nil	Nil	1·66	0·16	4·33	22·69	0·50	1·17	5·72
Cairns	13·33	3·21	Nil	0·35	0·62	0·12	0·37	0·42	7·88	25·74	8·59	6·81	...
Geraldton	38·73	11·81	0·39	1·78	3·99	0·76	2·49	1·18	7·35	28·37	5·71	8·26	20·51
Herberton	7·08	1·55	Nil	Nil	0·59	0·44	0·62	1·15	2·06	7·39	3·37	0·75	2·41
Hughenden	1·36	0·07	0·44	Nil	Nil	0·22	4·10	1·76	0·28	3·37	0·07	0·70	3·84
Kamerunga	15·48	3·50	Nil	0·42	1·05	0·27	1·00	0·43	11·62	29·08	7·56	4·38	8·89
Longreach	0·31	2·78	0·04	Nil	Nil	Nil	4·66	0·72	1·34	1·17	0·53	0·17	2·41
Lucinda	11·30	4·00	Nil	0·45	Nil	2·00	1·90	0·50	2·10	15·40	1·68	2·79	23·06
Mackay	5·24	3·61	0·93	0·12	0·04	8·14	8·07	Nil	1·52	29·89	4 73	3·67	13·19
Rockhampton	13·82	0·77	1·26	0·03	Nil	0·22	1·36	1·32	1·60	15·39	0·92	0·06	8·93
Townsville	1·03	0·24	0·04	Nil	Nil	0·04	3·67	1·17	5·70	13·71	1·97	2·02	6·41
South.													
Barcaldine	1·19	3·85	0·16	Nil	Nil	0·20	3·88	1·02	6·54	1·85	0·12	0·25	1·56
Beenleigh	14·99	6·17	0·15	1·54	0·25	2·11	1·89	4·43	4·55	5·44	3·04	2·91	3·63
Biggenden	2·92	2·29	0·71	0·29	0·29	Nil	4·06	1·08	5·89	13·05	1·94	3·61	3·81
Blackall	3·76	3·08	0·32	0·12	0·14	Nil	4·99	0·53	5·04	3·19	0·23	2·34	5·02
Brisbane	7·23	4·04	0·59	1·48	0·53	1·59	1·28	2·36	3·65	9·09	2·64	2·65	4·50
Bundaberg	5·64	1·32	0·86	0·51	0·62	0·48	3·32	0·16	5·16	16·67	2·17	3·35	6·31
Caboolture	9·90	4·66	0·17	2·12	0·30	1·53	2·42	3·07	7·36	8·10	3·43	3·57	4·89
Charleville	3·62	3·07	0·31	0·52	0·15	0·40	3·14	0·09	2·51	1·70	0·73	1·67	3·87
Dalby	0·40	4·69	0·34	2·63	0·24	3·01	1·07	2·59	2·15	3·40	0·74	5·46	3·09
Emerald	5·88	1·23	0·96	0·06	0·09	0·06	1·44	2·43	2·44	7·77	0·25	1·76	6·00
Esk	4·91	3·99	0·20	2·43	0·33	3·10	2·90	2·90	3·07	8·26	0·85	1·87	3·52
Gatton College ...	2·59	3·79	0·45	2·12	0·07	1·09	1·95	1·14	2·42	5·57	1·10	1·71	4·22
Gayndah	1·63	1·61	0·93	0·99	0·41	0·27	2·49	0·67	2·36	11·34	0·82	1·58	4·06
Gindie	4·81	1·65	0·43	Nil	0·21	0·02	3·09	1·55	2·02	7·07	0·06	1·74	...
Goondiwindi	0·37	3·40	0·49	2·62	0·67	1·64	1·09	1·61	1·62	3·37	0·87	2·53	6·49
Gympie	10·86	4·11	0·60	1·11	0·47	0·84	4·08	2·55	3·94	9·75	2·29	2·00	7·05
Ipswich	4·71	3·50	0·23	1·75	0·05	1·56	3·20	1·62	4·25	6·87	1·30	1·85	2·86
Laidley	2·83	3·12	0·32	1·68	Nil	1·87	1·87	3·99	5·26	9·93	2·33	2·17	4·11
Maryborough	10·07	4·42	1·37	0·39	0·46	0·62	3·52	2·62	2·33	20·69	2·67	2·78	3·48
Nambour	15·43	6·94	0·32	1·78	0·59	0·43	1·62	2·08	7·54	13·50	5·38	3·58	6·65
Nerang	13·83	7·52	0·19	1·12	1·22	2·21	3·52	2·39	3·85	4·95	4·99	5·61	8·98
Roma	5·06	3·73	0·20	0·84	0·70	1·22	1·43	0·03	1·76	2·65	1·74	1·44	2·70
Stanthorpe	0·71	4·11	0·66	2·64	0·34	1·85	3·98	1·92	5·00	3·04	0·37	5·29	2·64
Tambo	5·46	3·96	0·28	0·61	0·22	Nil	3·31	0 80	3·90	3·54	1·34	2·54	5·12
Taroom	2·21	3·49	0·54	0·59	0·82	0·05	2·42	1·73	2·92	3·25	1·63	2·73	6·17
Tewantin	30·39	9·20	0·21	1·11	2·20	0·50	1·09	1·93	7·61	11·79	2·91	3·64	12·43
Texas	0·03	2·99	0·70	2·12	0·48	0·81	1·63	0·76	2·97	3·77	0·09	2·47	3·78
Toowoomba	3·29	4·08	0·38	2·58	0·02	2·24	1·61	2·26	2·75	4·50	1·91	4·17	5·27
Warwick	0·66	2·85	0·53	1·98	0·19	2·76	2·89	1·92	3·65	1·52	1·28	6·20	2·06
Westbrook	9·00	3·18	0·22	2·24	0·14	2·29	4·85	3·37	3·65	2·46	0·57	2·00	1·24

GEORGE G. BOND,
For the Hydraulic Engineer.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian: Victorian, 92s. to 93s.; New South Wales, 90s.; Queensland, 88s.; New Zealand, 94s. to 96s; Danish, 98s. to 100s. per cwt.

CHEESE.—Canadian, 53s.; New Zealand, 50s. to 51s. per cwt.

CONDENSED MILK.—10s. to 18s. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and ¼ per cent.).—Refined, £23 to £24 10s.; raw, £20 to £22 per ton; German beet, 88 per cent., 12s. 3d. per cwt.

MOLASSES (duty, 1s. to 2s. per cwt. and ⅛ per cent.).—4s. to 9s. per cwt.

RICE.—Rangoon, £8 to £12; Japan, £12 to £16; Java, £12 to £20; Patna, £10 to £17 per ton.

COFFEE (in bond, duty 1½d. per lb. and ½ per cent.).—Ceylon plantation, 110s. to 125s.; peaberry, 62s. to 120s.; Santos, 37s. to 55s.; Mocha, 56s. to 90s.; Jamaica, 50s. to 120s. per cwt.

Chicory Root, dried (duty paid).—25s. to 27s. per cwt.

Arrowroot.—St. Vincent, 1½d. to 3½d.; Natal, 3d. to 5d.; Bermuda, 1s. 3d. to 1s. 5d. per lb.

Wheat.—Duluth, 35s. 6d. per 480 lb.; English, 33s. per 504 lb.; South Australian, 31s. 9d. per 480 lb.; Queensland, 31s. 3d. to 31s. 9d. per 480 lb.

Flour.—29s. 6d. to 32s.; Australian, no quotation.

Malting Barley.—33s. to 37s., undressed, 27s. 6d. per 448 lb.

Oats.—18s. to 21s. per 336 lb.; New Zealand, 21s. to 23s. per 384 lb.; Australian, 14s. 9d. to 15s. per 320 lb.

Split Peas.—37s. to 47s. per 504 lb.

Ginger.—Jamaica, 45s. to 55s.; Cochin, 50s. to 65s.; Japan, 16s. to 17s. per cwt.

Vanilla.—3s. to 7s. per lb.

Pepper.—Capsicums, 14s. to 60s.; chillies, 40s. to 45s. per cwt.; black, 5d¾. to 6d.; white, 7½d. to 7⅝d. per lb.

Green Fruit.—Apples: Australian—Ordinary, 7s. to 10s.; New Yorks, 11s. to 13s. 9d.; Cleopatras and Jonathans 11s. to 13s.; Tasmanian, 6s. to 13s. 6d., Coves, 15s. 6d per case; pears, 6s. 6d. to 11s. per tray, and 4s. (damaged) to 28s. per case; Canadian, 20s. to 30s.; Californian, 23s. to 25s. per case; bananas, 7s. to 13s. per bunch; pineapples, 3s. 6d. to 8s. each; oranges, Valencia, per 420, common, 5s. to 8s. 6d.; ordinary, 10s. to 11s. 6d.; medium, 15s. to 17s.; fine selected, 18s. to 22s.; finest selected, 25s. to 41s.; lemons, Messina, per 360, finest selected, 20s. to 25s.; ordinary to fine, 12s. to 16s.

Dates.—Tafilat, 50s. to 56s.; Egyptian, 30s. to 32s. per cwt.; Persian, 9s. to 12s. per case.

Cotton.—Uplands, 4d. to 6d., according to staple and quality; Sea Island, 12½d. to 16½d. per lb.

Cotton Seed.—£5 6s. 3d. to £5 10s. per ton.

Cotton-seed Oil.—Crude, £14 12s. 6d.; refined, £15 15s. to £17 5s. per ton.

Cotton-seed Oil Cake.—£4 10s. to £4 11. 3d. per ton.

Linseed.—38s. to 50s. per 416 lb.

Linseed Oil.—£16 2s. 6d. to £16 5s. per tun (252 gallons).

Linseed Oil Cake.—£7 12s. 6d. to £7 15s. per ton.

Olive Oil.—£33 10s. to £60 per tun (252 gallons).

Copra (cocoanut-kernel).—£17 10s. to £17 17s. 6d. per ton.

Cocoanut Oil.—£35 per ton.

Honey.—Queensland, 20s.; Jamaica, 22s. 6d.; New Zealand, 32s. 6d. per cwt.

Beeswax.—Australian, £7 to £8 per ton.

Lucerne Seed.—65s. per cwt.

Canary Seed.—65s. to 90s. per quarter.

Manilla Hemp.—£38 10s. to £40 per ton.

Sisal Hemp.—£35 to £36 10s. per ton. The latest quotations for sisal hemp in the Hamburg market range from £35 16s to £38 16s. per ton. These prices have ruled for the past six months in the Hamburg market.

New Zealand Hemp.—£31 to £32 10s. per ton.

Flax.—£48 to £52 per ton.

Tapioca (duty, 5d. per cwt.).—1d. to 2d. per lb.; pearl, 10s. to 14s. per cwt.; Cassava flour, 5s. to 12s. per cwt.

Eggs.—French, 6s. 9d. to 10s.; Danish, 6s. 9d. to 9s. 3d. per 120.

Bacon.—Irish, 60s. to 68s.; American, 36s. to 44s.; Canadian, 46s. to 56s. per cwt.

Hams.—Irish, 84s. to 96s.; English, 84s. to 100s.; American, 42s. to 47s. per cwt.

Tallow.—Mutton, fine, 28s. 9d.; medium, 25s. 6d.; beef, fine, 25s. 9d.; medium, 24s. per cwt.

Poultry (Smithfield).—Good supplies on offer, but a quiet demand. Quotations:—Fowls (each): Yorkshire, 3s. to 3s. 6d.; Essex, 3s. 6d. to 3s. 9d.; Boston, 2s. 9d. to 3s. 3d.; Surrey, 4s. 3d. to 5s.; Sussex, 3s. 9d. to 4s. 6d.;

Welsh, 2s. 6d. to 3s.; Irish, 2s. 3d. to 2s. 9d.; turkey—cock, 7s. 6d. to 10s.; hen, 5s. to 6s.; geese, 5s. 6d. to 6s. 6d.; Australian rabbits, 7s. 6d. to 11s. per dozen; Guinea fowls, 2s. 6d. to 3s.; wild duck, 1s. 9d. to 2s. each. Queensland poultry: Ducks, 3s. 6d. to 3s. 9d.; chickens and capons, 3s. 3d, each; turkeys, 7d. to 9d per lb.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

	May 13.	May. 20.
New Zealand Sheep.		
(Crossbred Wethers and Merino Ewes.)		
Canterbury, light (48 lb. to 56 lb.)	None offering.	
Canterbury, medium (56 lb. to 64 lb.)	$4\frac{1}{2}$d.	$4\frac{1}{2}$d.
Canterbury, heavy (64 lb. to 72 lb.)	4d.	4d.
Dunedin and Southland (56 lb. to 64 lb.)	None offering.	
North Island (56 lb. to 65 lb.), ordinary	$3\frac{15}{16}$d.	$3\frac{11}{16}$d.
North Island, best	4d.	$3\frac{7}{8}$d.
Australian Sheep.		
(Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{1}{8}$d.	3d.
Light (under 50 lb.)	$3\frac{5}{16}$	$3\frac{1}{4}$d.
River Plate Sheep.		
(Crossbred and Merino Wethers.)		
Heavy (over 50 lb.)	$3\frac{3}{8}$d.	$3\frac{1}{8}$d.
Light (under 50 lb.)	$3\frac{7}{16}$d.	$3\frac{3}{8}$d.
New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Canterbury, heavy (36 lb. to 42 lb.)	$5\frac{1}{2}$d.	$5\frac{1}{2}$d.
Dunedin and Southland (28 lb. to 42 lb.)	$5\frac{1}{2}$d.	$5\frac{1}{2}$d.
North Island (28 lb. to 42 lb.) ...	$5\frac{3}{4}$d.	$5\frac{3}{4}$d.
Australian Lambs.		
30 lb. to 40 lb., first quality ...	None offering.	
30 lb. to 40 lb., second quality ...	5d.	5d.
River Plate Lambs.		
30 lb. to 40 lb.	$4\frac{5}{8}$d.	$4\frac{5}{8}$d.
New Zealand Frozen Beef.		
Ox, fores (180 lb. to 220 lb.) ...	$2\frac{1}{2}$d.	$2\frac{1}{2}$d.
Ox, hinds (180 lb. to 220 lb.) ...	$3\frac{1}{2}$d.	$3\frac{1}{2}$d.
Australian Frozen Beef.		
Ox, fores (160 lb. to 200 lb.) ...	None offering.	
Ox, hinds (160 lb. to 220 lb.) ...	None offering.	
River Plate Frozen Beef.		
Ox, fores (160 lb. to 220 lb.) ...	$2\frac{3}{8}$d.	$2\frac{3}{8}$d.
Ox, hinds (160 lb. to 220 lb.) ...	$3\frac{3}{8}$d.	$3\frac{3}{8}$d.

QUEENSLAND TIMBER.—Selectors who have marketable cedar on their land should note that Queensland cedar is quoted in the English market at from 3d. to 4d. per superficial foot. Only well-squared logs are wanted. Kauri pine planks are in demand, at from 2s. 3d. to 2s. 9d. per cubic foot, and from 1s. 9d. to 2s. for logs. For hardwoods there is small demand. Ivory wood should be carefully preserved from destruction.

General Notes.

DEFEATING THE CUT-WORM.

The cut-worm, which does so much damage to cabbages, carries on its nefarious work just a little below the surface. A farmer writes to an American paper that he adopts a plan which is effectual in protecting plants against the attacks of these pests. He gives elaborate directions, which, summed up, simply mean this: Make a small cone of stiff paper, pass the root of the plant through a hole in the bottom of the cone; then set the plant so that the paper is about an inch above the surface of the soil and a couple of inches below. Sprinkle a little soil inside the paper cone next the stem of the plant to keep the paper stiff. The worms will thus be defeated. Where cut-worms are numerous, the little extra trouble pays far more than replanting two or three times.

TO PREVENT A HEN SITTING.

Many people have asked us how to prevent a hen from sitting. The swinging coop appears to us to answer fairly well, but, as usual, it remains with the Americans to suggest a novel method. The *Chicago Chronicle* is responsible for the following idea:—The cure consists of a cheap watch that ticks loudly and clearly, and is enclosed in a white, egg-shaped case. When a hen manifests a desire to sit at the wrong time, the poultryman gently places under her this bogus egg, and the egg does the rest. Cheerfully it ticks away. The hen soon begins to show signs of uneasiness. She stirs the noisy egg with her bill, thinking, perhaps, that it is already time for it to hatch, and the chicken in it wants to get out. She grows more and more nervous as the noise keeps on, and finally she jumps off the nest and runs round a while to get cooled. Generally she returns to her self-imposed duty; but things get worse and worse with her. She wriggles about and cackles, ruffles her feathers, and looks wild, until at last, with a frenzied squawk, she abandons the nest for good and all. The fever of incubation is broken up completely. The poultryman who has discovered this method declares that he has never found a hen that could stand the strain of the conversational egg for more than three hours. In much less time than that, as a rule, the hen is ready to return to her legitimate business.

GRAPE VINE CUTTINGS.

In the course of the next two months, vignerons will be pruning their vines, and those who propose extending their vineyards or laying down new ones will be afforded the opportunity of obtaining many valuable varieties from the State farms at Westbrook and Biggenden. All the vines in the farm vineyards have been carefully selected either for their value as table grapes or for wine-making. The list of varieties is too long to be given here in its entirety, but vignerons with a knowledge of the particular wine or table grape they require may, with confidence, leave their orders in the hands of the managers of the above State farms, with the certainty that the cuttings are all true to name. It should, however, be noted that Black Monnukka and Ladies' Fingers cannot be supplied from Westbrook or Biggenden.

Attention is drawn to an advertisement on another page in which some of the varieties are named and prices and conditions given.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

AUSTRALIA'S FATTEST BULLOCK.

OVERLANDER, Burketown.—

The *Australian Agriculturalist* says:—The fattest bullock ever produced in Australia was bred at Monkira Station, West Queensland, and travelled to the Adelaide market by road and rail, a distance of over 1,006 miles. It was picked out of the mob and topped up for the September show of 1894, where it won first prize. Its live weight was 3,043 lb., and the dressed carcass weighed 1,992 lb. A seven-year-old prize fat bullock was shown in Dunedin, whose dressed weight, including the head, was 2,043 lb. The Durham ox which was exhibited in England many years ago weighed 2,322 lb.

SISAL HEMP LAND.

CANE FARMER, Nambour.—We have never advised planting sisal hemp on rich new scrub land. If you do so, you will have quite three years during which to keep the land clean before you get any return. Certainly you can grow low-growing crops, such as vegetables, peanuts, &c, between the rows for a couple of years; but sugar-cane, maize, imphee, or oats must not be grown on the same land as sisal hemp, as the plant requires full sunlight. We would advise you to grow sugar-cane on your good land. You have a mill in the district, and you will get three crops, worth from £10 to £15 per acre, whilst you would get no return from the sisal for three years. By all means plant it in any barren, rocky soil you may have which is unsuitable for cane, but grow sugar or cotton on your good land.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Prices.
Apples, Eating, per packer, Victorian	6s. to 8s.
Apples, Eating, per packer, Tasmanian	5s. to 6s. 6d.
Apples, Cooking	6s. to 7s.
Apples, Local	...
Apples, American, Green	...
Apricots, quarter-case	...
Apricots, American, per 108's	...
Bananas, Sugar, per bunch	3d. to 10½d.
Bananas, Cavendish, per bunch	3d. to 1s.
Bananas, per dozen	1½d.
Cape Gooseberries, quart	...
Cherries, quarter-case	...
Comquats, case	2s.
Custard Apples, quarter-case	2s. to 3s.
Grapes, per lb.	3½d. to 4d.
Granadillas, case	...
Gooseberries, English	...
Lemons, American, per case	...
Lemons, Local	3s. to 5s.
Lemons, Italian, per case	...
Lemons, Italian, per 180	...
Loquats, half-gincase	...
Mandarins, Local	2s. to 4s.
Mandarins, Bowen	...
Mangoes, half-case	...
Mangoes, good, half-case	...
Melons, per dozen	...
Nectarines, quarter-case	...
Oranges, Italian, per 180	...
Oranges, American	9s. to 10s. 6d.
Oranges, Sydney (packers)	...
Oranges, Local	2s. to 2s. 6d.
Passion Fruit, quarter-case	3s. to 3s. 6d.
Papaw Apples, per case	2s. to 3s.
Peanuts, per lb.	2½d.
Pears, Victorian, quarter-case	7s. 6d. to 9s. 6d.
Pears, Tasmanian, quarter-case	3s. 9d. to 4s. 6d.
Persimmons, quarter-case	3s. to 4s.
Pineapples (rough leaf), per dozen	1s. to 3s.
Pineapples (smooth leaf), per dozen	3s. to 4s.
Plums, Black, quarter-case	3s. to 5s.
Plums, Light, quarter-case	2s. to 3s. 6d.
Plums, American, per 108's	...
Quinces, quarter-case	1s. 6d. to 3s. 6d.
Rosellas, per sugar-bag	1s.
Tomatoes, quarter-case	1s. to 1s. 6d.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL.

Article.		MARCH. Prices.
Bacon (Pineapple)	lb.	$5\frac{1}{2}$d. to $7\frac{1}{2}$d.
Barley, Malting	bush.	3s. to 3s. 3d.
Bran	ton	£4.
Butter, Factory	lb.	9d. to 11d.
Chaff, Mixed	ton	£2 15s.
Chaff, Oaten	,,	£3 to £4 5s.
Chaff, Lucerne	,,	£2 10s. to £3.
Chaff, Wheaten	,,	£2 5s.
Cheese	lb.	$6\frac{1}{2}$d. to $7\frac{1}{2}$d.
Flour	ton	£8 to £8 10s.
Hay, Oaten	,,	£5 to £5 5s.
Hay, Lucerne	,,	£2 5s. to £2 7s. 6d.
Honey	lb.	1d. to $1\frac{1}{2}$d.
Maize	bush.	1s. 11d. to 2s. 3d.
Oats	,,	2s. to 4s. 3d.
Pollard	ton	£4 10s. to £4 15s.
Potatoes	,,	£4 15s. to £6 15s.
Potatoes, Sweet	,,	£1 to £1 6s.
Pumpkins	,,	£1 5s. to £1 11s. 8d.
Wheat, Milling	bush.	3s. to 3s. 5d.
Wheat, Chick	,,	2s. 6d. to 3s.
Onions	ton	£11 15s. to £12.
Hams	lb.	$8\frac{1}{2}$d. to $9\frac{1}{2}$d.
Eggs	doz.	10d. to 1s. 2d.
Fowls	pair	1s. 6d. to 2s. 9d.
Geese	,,	3s. 6d. to 4s. 3d.
Ducks, English	,,	1s. 6d. to 2s. 6d.
Ducks, Muscovy	,,	2s. 6d. to 3s. 6d.
Turkeys, Hens	,,	4s. 3d. to 5s. 3d.
Turkeys, Gobblers	,,	6s. to 9s.

ENOGGERA SALES.

Animal.	MARCH. Prices.	APRIL. Prices.
Bullocks	£7 5s. to £8 15s.	£7 7s. 6d. to £8 7s. 6d.
Cows	£5 7s. 6d. to £7 12s. 6d.	£5 7s. 6d. to £6 12s. 6d.
Wethers, Merino	20s. 6d.	23s.
,, C.B.	21s. 3d.	25s.
Ewes, Merino	14s. 3d.	13s. 3d.
,, C.B.	18s.	...
Lambs	13s. 3d.	15s. 3d.
Pigs, Baconers	36s.	33s.
,, Porkers	25s.	19s. 6d.
,, Suckers	8s. 6d.	7s. 9d.

Orchard Notes for June.

BY ALBERT H. BENSON.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the State, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as, no matter what the quality of the fruit may be, it always sells best when well packed and attractively got up, as the better it looks the better it sells.

I cannot lay too great stress on the extreme importance of handling the fruit carefully and of sweating it prior to shipment. The common practice of pulling the fruit from the tree and packing and shipping it straight away is responsible for a very large proportion of the loss so commonly met with in marketing the fruit early in the season. The skin in the earlier stages of ripening is rigid and full of moisture, so that it is easily bruised, the cells of the skin being ruptured. Fungus growths of various kinds attack the injured skin, with the result that the fruit soon becomes completely rotten, and is covered with a mass of greenish or bluish mould. This loss can be reduced to a minimum by cutting the fruit instead of pulling it, and by handling it like eggs instead of like road metal. In addition to the ordinary loss on the fruit by bad handling, a further loss takes place when it is found necessary to cyanide the fruit, as, for example, when it has to be shipped to the Southern States, as the gas at once finds out every bruise, case mark, or injury to the skin, such as plugging—viz., pulling the stem out—and turns the same black, thereby greatly detracting from the value of the fruit.

In many parts of the State deciduous fruit trees should be pruned during the month, and I strongly advise fruit-growers to read my remarks on this subject which appeared in a previous issue of this *Journal*, as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off and a new head be allowed to form; but where such trees only produce inferior fruit that is of no commercial value, they should be either destroyed or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any disease that may be on the wood that has been pruned off will be destroyed. When trees are hard cut back and only the main limbs are left, it is advisable to follow up the same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying. This mixture is also of value for painting the stems and main branches of citrus-trees covered with mosses or lichens, or attacked by White, Red, Circular, Black Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as the trees are pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast, the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Orchard Notes for July.

By ALBERT H. BENSON.

The remarks that have appeared in the Orchard Notes for the last three months anent the handling, packing, and marketing of citrus fruits apply equally to the present month.

The pruning of all kinds of deciduous fruit trees should be completed during the month. All prunings should be gathered and burnt, and the tree should then receive a thorough spraying with the lime, sulphur, and salt wash, which is the best all-round winter spray, acting both as an insecticide and a fungicide. After pruning and spraying, the orchard should be well ploughed, so as to bury all weeds and trash that may have accumulated, to sweeten the soil, and to break up any pan that may have been formed by summer cultivation.

Citrus trees, from which the fruit has been gathered, should be pruned now, the pruning to consist of cutting out all dead branches or branches having borers in them, as well as all branches, thorns, or twigs growing in the centre of the tree which are not required. The centre of the tree must be kept well opened up, as, unless this is done, the superfluous wood only forms a harbour for all kinds of insect and fungus pests, and, in addition to this, where the tree is not well pruned out in the centre, it is impossible to do good work with the spray pump.

As already stated, all the prunings from the tree should be gathered and burnt, as this is the surest way of destroying any scale insects, borers, or fungus pests with which they may be infested. If you have no spray pump, then the above mixture should be applied with a brush. It will destroy all scale insects with which it comes in contact, and will remove all moss and lichen as well as stop the spread of canker or bark rot.

The planting of deciduous trees can be continued throughout the month, but it is not advisable to delay it more than can be helped, as when the trees are planted, even though they make no leaf or wood growth, they begin to throw out adventitious rootlets which are ready to start work as soon as the first top growth takes place. Don't plant too deep: the depth at which the young trees stood in the nursery is the right depth; trim the roots carefully, so as to remove all bruised portions; spread the roots out well, so that they may get a good hold of the ground, and always spread a little fine top soil round them, as this will be conducive to the rapid formation of new roots.

Cut back hard at planting, and don't be afraid that you will spoil your tree by doing so. Failure to cut hard back prevents the formation of a strong, well-grown, symmetrical tree, and always tends to injure the future vigour and growth of the tree.

See that all trees that are planted, whether deciduous or evergreen, are free from pests, as it is much easier to keep disease out of the orchard by planting clean trees than it is to stamp out disease once it has got a fair hold. Where the trees are infested with scale insects of any kind, they should be treated by hydrocyanic acid gas, as recommended and described from time to time in this *Journal*. If this treatment of the young trees is carefully carried out, there is every chance of their remaining clean for a considerable time after they are planted.

Do not plant rubbish; only plant those trees that your soil and climate are adapted for. Do not try to grow fruits that will only end in failure, as no grower who is dependent on fruit culture for his living can afford to grow fruits that can be produced both better and cheaper by others under more suitable conditions; but he must confine his energies to the culture of those fruits that prove a commercial success.

It costs just as much to prepare the land for and to plant, prune, spray, manure, cyanide, and generally look after an inferior variety of fruit tree, or a variety of fruit tree that is unsuitable to the climate, and from which no return of any value can ever be obtained, as it does to grow a variety that is suitable to the soil and climate, that will produce superior fruit, and for which there is always a ready sale. Therefore, I again repeat that no grower who is dependent on fruit culture for his living can afford to spend time or money in the growing and looking after unsuitable varieties of fruit trees.

Farm and Garden Notes for June.

Farm.—Although frosts will, in all probability, have already occurred in some exposed parts of the South-western districts, yet winter does not practically begin until the 24th of the month. Insect life is now dormant, and weeds are no longer a serious trouble to the farmer. Hence, now is his time to sow lucerne. Sometimes a dropping season in May will start a growth of weeds, but this should not act as a deterrent, as the lucerne will in all likelihood overcome the now slow-growing weed crop. Rye, prairie, and other grasses may also now be sown.

Oats, barley, vetches, clover, tobacco, buckwheat, and field carrots and swedes may now be sown. Those who propose to sow millets, sorghum, panicum, &c., should begin to get the land ready for these crops. Some advocate the sowing of early maize and potatoes towards the end of the month, but obviously this can only apply to the more tropical parts of Queensland. The land my be got ready, but in the Southern district and on the tableland neither maize nor potatoes should be got in before the end of July or in August. There is always a probability of frosts during these months. Arrowroot will be nearly ready for digging, but the bulbs should not be taken up until the first frosts have occurred. Dig sweet potatoes, yams, and ginger. Sweet potatoes may be kept, should there be a heavy crop, and consequently a glut in the market, by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the potatoes out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand. Then

pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process till the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Wheat for late harvesting may still be sown. It is too late for a field crop of onions. In tropical Queensland, the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Asparagus and rhubarb may now be planted in well-prepared beds or rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed; and the same remark applies to asparagus.

Cabbage should be planted out as they become large enough, also cauliflower, lettuce, &c.

Sow cabbage, red cabbage, peas, lettuce, broad-beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds such as sage, thyme, mint, &c. Eschallots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost; for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes, the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all

stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Farm and Garden Notes for July.

FIELD.—With a fairly good season the field operations generally for the month will consist of preparing the land for cotton, potatoes, maize, oats, barley, vetches, rye, tobacco, sisal hemp, sugar-cane, field carrots, mangolds, &c. Prairie and other grasses, if not already sown in March and April, may yet be sown. In suitable localities early potatoes may be planted, but the young shoots will run the risk of being nipped by frost. There is no better time for sowing lucerne. The soil should be a deep calcareous loam, where the roots can penetrate deep down into the subsoil in search of moisture and plant food. If the subsoil is at all tough, it should be loosened to at least a depth of 18 inches, by the help of the subsoil plough, but on no account should the subsoil be brought to the surface. The land must be brought to the finest possible tilth, to give the seed every chance of germinating. After sowing, run a light harrow over the land to cover the seed. From 10 lb. to 12 lb. of seed is sufficient for an acre. During suitable weather, rice may be sown in the North and on the Southern coast. The coffee crop should now be harvested. Yams and turmeric should be unearthed.

KITCHEN GARDEN.—Full sowings may be made of cabbage, carrot, broad-beans, lettuce, parsnips, beans, peas, radishes, leeks, spring onions, beetroot, eschallots, mustard and cress, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad-beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, and squashes during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Plough up or dig all vacant land, and let it lie in the rough until required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, and air.

FLOWER GARDEN.—The roses will now want looking after. They should have already been pruned, and now any shoots which have a tendency to grow in wrong directions and to crowd the centre of the bush should be rubbed off. Overhaul the ferneries, and top dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses, where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemums, tricolor, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

Times of Sunrise and Sunset, 1905.

DATE.	APRIL.		MAY.		JUNE.		JULY.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·59	5·46	6·14	5·16	6·32	5·0	6·40	5·4
2	5·59	5·45	6·14	5·15	6·32	5·0	6·40	5·4
3	6·0	5·44	6·15	5·14	6·32	5·0	6·40	5·4
4	6·0	5·43	6·15	5·13	6·32	5·0	6·40	5·5
5	6·0	5·42	6·16	5·13	6·33	5·0	6·40	5·5
6	6·1	5·41	6·17	5·12	6·33	5·0	6·40	5·5
7	6·1	5·40	6·17	5·12	6·34	5·0	6·40	5·6
8	6·2	5·39	6·18	5·11	6·34	5·0	6·39	5·6
9	6·2	5·38	6·18	5·11	6·35	5·0	6·39	5·6
10	6·3	5·37	6·19	5·10	6·35	5·0	6·39	5·7
11	6·3	5·36	6·19	5·10	6·35	5·0	6·39	5·7
12	6·4	5·35	6·20	5·9	6·35	5·0	6·39	5·7
13	6·4	5·34	6·20	5·8	6·36	5·0	6·39	5·8
14	6·5	5·33	6·21	5·8	6·36	5·0	6·39	5·8
15	6·5	5·32	6·21	5·7	6·36	5·0	6·38	5·9
16	6·6	5·31	6·22	5·7	6·36	5·0	6 38	5·9
17	6·6	5·30	6·23	5·6	6·36	5·0	6·38	5·10
18	6·7	5·29	6·23	5·6	6·36	5·1	6·37	5·10
19	6·7	5·28	6·24	5·5	6·36	5·1	6·37	5·11
20	6·8	5·27	6·25	5·5	6·37	5·1	6·36	5 11
21	6·8	5·26	6·25	5·4	6·37	5·1	6·36	5·12
22	6·9	5·25	6·26	5·4	6·37	5·1	6·35	5·12
23	6·9	5·24	6·26	5·3	6·37	5·2	6·35	5·13
24	6·10	5·23	6·27	5·3	6·38	5·2	6·34	5·14
25	6·10	5·22	6·27	5·2	6·38	5·2	6·34	5·14
26	6·11	5·21	6·28	5·2	6·38	5·2	6·33	5·15
27	6·11	5·20	6·28	5·1	6·38	5·2	6·33	5·15
28	6·12	5·19	6·29	5·1	6·39	5·2	6·32	5·16
29	6·13	5·18	6·30	5·0	6·39	5·3	6·32	5·16
30	6·13	5·17	6·31	5·0	6·39	5·3	6·31	5·17
31	...	...	6·31	5·0	...	...	6·31	5·17

PHASES OF THE MOON.

			H.	M.	
5 April	●	New Moon	9	23	a.m.
13 ,,	☾	First Quarter	7	41	,,
19 ,,	○	Full Moon	11	38	p.m.
26 ,,	☽	Last Quarter	9	14	,,
5 May	●	New Moon	1	50	a.m.
12 ,,	☾	First Quarter	4	46	p.m.
19 ,,	○	Full Moon	7	36	a.m.
26 ,,	☽	Last Quarter	12	50	p.m.
3 June	●	New Moon	3	57	p.m.
10 ,,	☾	First Quarter	11	5	,,
17 ,,	○	Full Moon	3	52	,,
25 ,,	☽	Last Quarter	5	45	a.m.
3 July	●	New Moon	3	50	a.m.
10 ,,	☾	First Quarter	3	46	,,
17 ,,	○	Full Moon	1	32	,,
24 ,,	☽	Last Quarter	11	9	p.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures :—

1905.	ROCKHAMPTON. Rise.	Set.	TOWNSVILLE. Rise.	Set.	COOKTOWN. Rise.	Set.
April ...	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.
May ...	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June ...	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July ...	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.